

THE DENTAL PRACTITIONER

monthly journal for the Practitioner and his Staff

VOL. III, NO. 10

JUNE, 1953

[*Incorporating the Official Supplement of*
The Dental Laboratories Section of the Surgical Instrument Manufacturers' Association]

CONTENTS

Editorial : 1558-1953

Suppurative Osteomyelitis of the Mandible (continued)
WALTER C. ALLWRIGHT, H.D.D. R.C.S. (Edin.), L.D.S. R.C.S. (Eng.), D.P.D.

Metallurgy, Mechanics, and Economics of Denture-base Alloys
E. A. SCHOOLDEN

Dental Board of the United Kingdom : Chairman's Address

The Proceedings of the British Society of Periodontology :
An Orthodontic View of Occlusion in relation to Periodontal Problems
C. F. BALLARD, F.D.S. R.C.S., M.R.C.S., L.R.C.P.

Society Notes

Critics' Corner

Parliamentary News

Abstract : The Selection of Forces for Tooth Movement

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THE DENTAL PRACTITIONER

A Monthly Journal for the Practitioner and his Staff

*(Incorporating the Proceedings of the British Society of Periodontology
and the Official Supplement of the S.I.M.A.—Dental Laboratories Section)*

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VOL. III, No. 10

CONTENTS

JUNE, 1953

	PAGE
EDITORIAL: 1558-1953	295
SUPPURATIVE OSTEOMYELITIS OF THE MANDIBLE (<i>continued</i>)	
<i>Walter C. Allwright, H.D.D. R.C.S. (Edin.), L.D.S. R.C.S. (Eng.), D.P.D.</i>	296
METALLURGY, MECHANICS, AND ECONOMICS OF DENTURE-BASE ALLOYS	
<i>E. A. Schoolden</i>	303
DENTAL BOARD OF THE UNITED KINGDOM: CHAIRMAN'S ADDRESS	308
SOCIETY NOTES	310
THE PROCEEDINGS OF THE BRITISH SOCIETY OF PERIODONTOLOGY:	
AN ORTHODONTIC VIEW OF OCCLUSION IN RELATION TO PERIODONTAL PROBLEMS	
<i>C. F. Ballard, F.D.S. R.C.S., M.R.C.S., L.R.C.P.</i>	311
CRITICS' CORNER	321
PARLIAMENTARY NEWS	322
OFFICIAL SUPPLEMENT OF THE SURGICAL INSTRUMENT MANUFACTURERS' ASSOCIATION—	
DENTAL LABORATORIES SECTION	323
ABSTRACT: THE SELECTION OF FORCES FOR TOOTH MOVEMENT	328

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THE DENTAL PRACTITIONER

A Monthly Journal for the Practitioner and his Staff

Vol. III, No. 10

June, 1953



EDITORIAL

1558 - 1953

In this Coronation month many minds will turn back through the centuries to an earlier period in history when another Queen Elizabeth was crowned Queen of England. It has been called the "Golden Age" when art and literature were at their height and the world had its centre in the City of London. Despite the greatness of this age, it would be wrong to assume that there has been no progress since then save in scientific advancement and the creature comforts of life. The Elizabethan era laid a corner stone upon which we have been building ever since and which has now become the gigantic social structure in which we live to-day. The Barber's College was granting special licences to "drawe teeth and make cleane teeth" which laid the foundation for a scientific study of dentistry, separated from medicine. It was a small handful of men who kept the torch alight, for it was not until 1685 that the first known book on dentistry was published. This was Charles Allen's *The Operator and the Tooth*. It was obviously well received, as it was reprinted in 1686 and yet again in 1687. Apart from these small beginnings in the study of dentistry, the population, including the Queen, suffered agonies from

toothache. The only treatment was extraction, carried out by quacks and charlatans at fairs and street corners. It was conducted with mumbo-jumbo, charms, spells, and incantations, whilst a big drum was beaten loudly to hide the cries of the patients. Henztner, the German visitor to the court of Queen Elizabeth, stated that it was a characteristic of the English to have bad teeth, and added—like a modern dentist—that it was due to their too great love of sugar. Even four hundred years ago common sense told them of the connexion between sugar and caries. While their drugs may have been based on magic, their instruments were a fact. Even the surgeon's chest in the army contained the appropriate set of tooth extracting forceps.

Such was the beginning of dentistry in this country; from there we have grown up into an organized professional scientific body, still searching for the truth as did those men of old. They had no microscopes and scientific instruments to guide them, only their common sense and keen observation. Let us remember them when in future years of this reign we are still seeking for the truth.

SUPPURATIVE OSTEOMYELITIS OF THE MANDIBLE

WITH PARTICULAR RELATION TO ITS INCIDENCE IN THOSE OF CHINESE RACE

(Continued from page 232)

By WALTER C. ALLWRIGHT, H.D.D. R.C.S. (Edin.), L.D.S. R.C.S. (Eng.), D.P.D.

TREATMENT

I. Acute Stage.—Treatment must be directed as soon as possible towards the establishment of free drainage. Multiple incisions through the gum and periosteum in the alveolus and body of the mandible will usually be necessary. If there is acute soft-tissue involvement with extension into the floor of the mouth and towards the neck, extra-oral incisions and insertion of drainage-tubes will be necessary. This is standard practice for the relief of cellulitis and need not be described in detail here.

Large doses of parenteral penicillin should be given. Intra-muscular injection of 500,000 units initially, followed by 100,000 units six-hourly, may be considered a minimum requirement for an acute infection. Bed rest is essential, and the diet should be light and nourishing and include extra vitamins. Daily evacuation of the bowels is important. Heat should not be applied to the face as this may have the effect of causing a spread of infection. Cameron (1925) draws attention to this danger, and advises against the use of hot water bottles, electric pads, poultices, and ichthyol. For the same reason the use of radiant heat therapy should be avoided. Particular attention must be paid to the toilet of the mouth. Careful syringing with a warm mild antiseptic should be performed frequently. This is soothing to the patient, particularly if the liquid is just above body temperature. Hydrogen peroxide is unsuitable owing to the bubbling produced which may carry infection deeper into the tissues.

Cultures of the organisms found in the pus should be made, and their relative sensitivity to penicillin tested. If organisms insensitive to this antibiotic are found, especially Gram-negative bacilli, streptomycin or aureomycin

may be used as an adjunct. In most cases, however, only penicillin-sensitive organisms will be found. Thoma (1947) recommends the local use of streptomycin in suitable cases. He points out, however, that while streptomycin may have an inhibiting effect on Gram-positive as well as Gram-negative organisms, most strains of Gram-positive organisms are more sensitive to penicillin than to streptomycin. Penicillin therefore continues to be the drug of choice in most cases. Spring (1950) states unequivocally that if penicillin is used during the initial stage of osteomyelitis before sequestration has set in, spontaneous healing is to be expected. Walker (1946) agrees with Hudson (1946) that the best method of treating acute cases is to institute systemic penicillin and wait and observe the progress. Walker believes that the use of penicillin systemically without surgical interference will be the method of choice in the future. If the organisms are sensitive to penicillin he fails to see the need of surgery apart from the possible treatment of a residual infection. Butler (1946) has no doubt that the introduction of penicillin has reduced the mortality of acute osteomyelitis from 25 per cent to about 3–5 per cent. Tratman (1949) states that since the introduction of the sulpha drugs and penicillin the mortality from osteomyelitis in Singapore has fallen to probably less than 5 per cent from the pre-war figure of 20 per cent.

Penicillin may be used locally with caution, so as to avoid interference with free drainage. Penicillin lozenges may be of help, and where through and through drains from mouth to skin exterior have been inserted, frequent irrigation with aqueous solution of penicillin is of value. Oringer (1948) describes the use of penicillin cones applied locally in the affected area in a case of osteomyelitis of the

maxilla. This treatment proved completely ineffective, and the prolonged presence of these cones and the progressive deterioration after their insertion would indicate that they may have aggravated the condition by acting as foreign bodies in the area. Oleaga Alarcón (1947) states that penicillin has lowered the complications of osteomyelitis if given in large doses parenterally and locally, but the penicillin should be considered as an auxiliary to surgery and not a substitute.

Teeth involved in the infected area will rapidly become loosened, and should be extracted. When they are very loose, there is no danger of opening up fresh areas of bone to infection as the teeth are no longer held in bony sockets. Slightly loosened teeth in adjoining areas which are within the zone of infection should not be extracted because of the danger of extension of infection. Acutely inflamed gums are liable to severe hæmorrhage, and very loose teeth will in such cases be an impediment to the application of pressure as a means of arresting the bleeding.

Trotman (1934) advocates extraction of all thoroughly loosened teeth, but does not state clearly whether he would apply such treatment in the case of acute osteomyelitis. Most of his cases appear to be subacute or chronic. Read (1936) advises against extraction of teeth as a method of providing drainage during the period of acute symptoms, particularly if force be necessary and trismus has to be overcome. Wilensky (1932) has written a great deal on the treatment of osteomyelitis of the jaws, and is very firmly of the opinion that no teeth should be extracted once the acute stage of the disease has been established. Round (1936), on the other hand, feels that if more or less ideal conditions of anaesthesia and hospitalization are available, extractions may be performed with benefit to the patient, in addition to the non-controversial methods of incision and drainage.

Radical surgery is no doubt dangerous during the acute stage of osteomyelitis, and most authorities prefer to wait until the infection has subsided somewhat. Attention is drawn in this respect to a case which was in the care of Mr. John Gray in Hong Kong.

In spite of what appeared to be free drainage of pus, which was most profuse, the disease continued to spread and the patient became extremely ill. Resection of the mandible was carried out in the acute stage. This operation was followed by marked improvement in the patient's condition. In this case it is possible that had holes been drilled through the outer plate to permit escape of pus from the cancellous bone, a similar improvement in general condition may have resulted. Such a method of treatment is advocated by Stones (1951) in rare cases. The raising of a mucoperiosteal flap and the drilling of several holes into the locality of the inflammation is recommended by Hardgrove (1930). He explains that if such treatment does not control the infection, the drill holes do no harm.

While advocating early radical surgery, Mowlem (1945) operates only after the extent of areas of dead bone can be determined. This may presumably be at least some days after the onset of the acute disease when with the use of antibiotics some diminution of the virulence of the disease may be expected. Eckhoff (1945), in discussing Mowlem's paper, says firmly that one must learn the danger of radical surgery in the acute stages of osteomyelitis. He suggests that radical surgery should never be employed in the first three weeks owing to the danger of fulminating septicaemia and death.

Wass (1949) considers that the conservative method of treatment is dead and should never be resurrected. He believes that treatment should be by systemic penicillin combined with radical operation. His operation aims to remove at the earliest opportunity, as soon as a definite diagnosis can be made, all diseased bone and granulation tissue to relieve tension, thus preventing further spread of the disease.

2. Chronic Stage.—Chronic osteomyelitis is associated with necrosis of the bone. After a variable time, usually four to eight weeks after the acute stage has subsided, smaller or larger pieces of necrosed bone begin to be separated from the main body. New bone may be deposited concurrently, or may be delayed, apparently by the continued low-grade infection associated with degeneration

and sequestration of the necrosed bone. Antibiotics are of value in this stage in preventing new spread of infection and in assisting the formation of new bone.

Smith and Ganey (1950) discuss the use of streptomycin in chronic traumatic osteomyelitis. They draw attention to the problems in treatment with antibiotics of decreased vascularity in the region of the infection by reason of massive fibrosis and bone sclerosis, and the presence of foreign bodies and sequestra. There are difficulties in the determination of adequate dosage and of the resistance of the organisms. These authors have found that 400 mg. of streptomycin intramuscularly at 4-hourly intervals has maintained an adequate blood level in most instances. In employing streptomycin locally, they made a solution of 1 million units of the drug in 1000 c.c. of isotonic sodium chloride solution. The wound was lined with gauze, a single small catheter was inserted, and a gauze pack saturated with 100 c.c. of the concentrated solution was applied to the wound. The solution of streptomycin was then dripped through the catheter continuously for 12 hours daily. If infective drainage persisted the dosage was increased to 2 million or 4 million units until a pronounced clinical effect on the wound was noted. If the cultures showed that penicillin was indicated, it was used in the manner described, with 1 million units in another bottle connected with the streptomycin tube by a Y attachment.

The established method of treatment has been to delay surgical interference until one or more portions of necrosed bone may be lifted out readily, either intra-orally or extra-orally. Blair and Brown (1925), Hardgrove (1930), Tratman (1934), Read (1936), Durbeck (1946), and Kallenberger (1949) all advocate a strict policy of waiting until sequestration is obvious before interfering surgically. Blum and Cahn (1950) make a plea for conservatism in the treatment of osteomyelitis, and cite the case of a fifty-year-old woman who developed osteomyelitis in [234] region following a prophylaxis. This case was treated with aureomycin alone, and cleared up without surgical interference of any sort.

Miltner and Wolfe (1934) describe their method of treatment of suppurative osteomyelitis of the mandible in Peiping Union Medical College. They consider unsatisfactory the conservative methods used to deal with 85 cases treated between 1922 and 1932 which they review. In 90 per cent of these cases the disease had been of more than three months' duration, and they were then treated over a period varying from two months to two years with an average of 6.4 months. After this comparatively lengthy period of care, apparent healing occurred in only 39.1 per cent of cases, while the others continued to show active evidence of infection for a long time. The conservative method adopted had been the conventional one of making free incisions for drainage in the acute stage of the disease, and then awaiting sequestration before lifting out the loosened teeth and necrosed bone. Miltner and Wolfe state their main reasons for early radical operation as being to prevent the swallowing of pus by the patient, and to avoid spread of the disease. They apply the method described only to patients over the age of fourteen years. Their operation is carried out as soon as possible during the early chronic disease, that is, about 21 days after its onset. They divide the operation into four stages.

The first stage consists of the removal through a wide external incision of the necrosed bone even before it has separated from the healthy bone. The wound is not sutured, and is packed loosely with "Vaseline" gauze. In the second stage, teeth in the area of osteomyelitis are removed. Thirdly, exteriorization of the tooth sockets is carried out with partial resection of the alveolar process, followed by complete closure of gum margins with sutures to prevent further drainage of purulent material into the oral cavity. Finally, the jaw is immobilized by interdental wiring and the application of a jaw bandage. They claim good results with this method, which they say follows the principles laid down by H. Winnett Orr. They point out that the wide external incision allows perfect drainage, and the suturing of the gums prevents contamination of the excised areas by saliva and food.

Mowlem (1944, 1945) describes a somewhat similar method to that of Miltner and Wolfe. As soon as the extent of the necrotic process can be determined in the bone, through an external incision he removes the lower border of the mandible in the infected area. The cortex of the lower border possesses a poor blood-supply and so has less powers of resistance than the rest of the bone. Then the outer plate is cut away to expose the infected area. Excision is continued until nothing but bleeding healthy bone is left. The defect as a whole is saucerized so that after any mucosal defects have been closed the soft tissues of the cheek collapse into and obliterate the resultant cavity. He describes these soft tissues as a source of further blood-supply which helps to eliminate such infection as has been spread during the surgical intervention. The wound is syringed frequently with antiseptic and penicillin by means of two rubber catheters stitched into the tissues. These syringe- and drainage-tubes are removed from 7 to 10 days after operation. If after that time an infective discharge persists, it is taken as evidence that the original surgery has been insufficiently radical and that further operation is desirable. This is carried out without delay. Mowlem removes all infected bone even though fracture results. He considers that if the bone is so very badly infected then fracture will result anyway. He reports rather unsatisfactory results in the rare cases where the lingual plate is infected. The soft tissues of the floor of the mouth cannot be satisfactorily opposed to the raw areas of bone. In such cases he prefers not to suture, but to pack with penicillin gauze.

The present writer agrees with Miltner and Wolfe and with Mowlem as to the undesirability of allowing the process of sequestration to continue for weeks and months, and even years. In cases of massive necrosis pus will be constantly streaming from multiple sinuses on the unfortunate patient's face and neck. It is not agreed, however, that extra-oral operation is desirable with its consequent disfigurement, no matter how slight that is kept by careful surgery. In the experience of the present writer in Hong Kong, 90 per cent of cases of osteomyelitis of the mandible may be success-

fully treated in the chronic stage by surgical operation using the intra-oral approach. The remaining 10 per cent will be represented by cases where the infection is confined solely to the lower border of the body of the mandible, or to the posterior border of the ascending ramus. Access from the mouth is extremely difficult in such cases, and is possible only after removing varying amounts of sound bone and so unnecessarily increasing the shock and after-pain associated with the operation.

Intra-oral removal of infected and necrosed bone is carried out as soon after the establishment of the chronic stage of the disease as possible. This is likely to be before sequestration is clinically apparent, although radiographic evidence of bony changes may be clearly shown. The technique employed is as follows:—

The patient is hospitalized and is given extra vitamins, and extra diet such as eggs and milk are prescribed if necessary. After a day or two in bed a chronic case of osteomyelitis will not usually have a very high temperature, and may be no higher than 99° F. Pre-operative medication should include atropine or other drug to inhibit the secretions. A general anæsthetic with endotracheal tube is an absolute necessity. To attempt to treat these cases using general anæsthetics without tubes is most hazardous. As a routine, it is a safe rule to make that if the necrosed bone requires a general anæsthetic for its removal, then endotracheal anæsthesia must be employed. Local anæsthesia is contra-indicated in all cases owing to the danger of spreading the infection. Often quite large pieces of bony sequestra may be removed without anæsthesia of any kind. A characteristic of chronic osteomyelitis is the diminution of sensory nerve reaction.

The patient having been anæsthetized and a throat pack having been inserted, any teeth in the area of infection are extracted. Incision is made along the crest of the bony alveolar ridge in the affected area and just beyond, and if the ascending ramus is involved, incision is extended upwards and backwards. Further incisions will be necessary buccally at right angles to the original incision, cutting to the

reflection of the labial and buccal mucosa. Incisions to the lingual aspect are rarely necessary. The soft tissues are then reflected buccally and labially, care being taken that the periosteum is reflected with the other soft tissues. Bleeding will be profuse, and the sucker will be in constant use. It may be necessary to check the hæmorrhage from time to time by the application of hot swabs. When the infected bone is exposed, instruments are applied to elevate all bone which is found to be not firmly attached to the main body. When loose portions of necrosed bone have been removed with elevators and forceps (long-beaked American pattern lower root forceps) are useful, together with small necrosis forceps, the remaining bone should be tested for strength. The surgeon can readily feel on application of the elevator whether or not the bone is sound and firmly attached to the main body of the mandible. Difficulties are experienced in children's mandibles when the sound bone is soft, and it is difficult to distinguish necrosed and healthy bone by feel alone. In case of uncertainty as to whether a bone surface or edge should be further resected, a small piece of bone may be snapped off with bone forceps. The small fragment may then be carefully examined. It must be realized that deep in the molar region and ascending ramus of the mandible it is almost impossible to see clearly the bone because of the hæmorrhage. Therefore most of the manipulation must be by feel alone.

Sometimes pathological fracture of the body of the mandible may occur at operation or before, or even a large complete section of the mandible may be found necrosed and is removed. If infection has spread up the ascending ramus to the coronoid and condyloid processes, excision of such parts is usually necessary. Removal of the condyle may not be possible in an early case, but after the disease has been established a few weeks, destruction of the retaining capsule and ligaments will have taken place and the condyle will be relatively loose in the tissues.

After all necrotic bone has been removed and nothing but healthy bone is left, any excess soft tissue is trimmed, penicillin powder

insufflated into the wound, and the patient returned to the ward. The gutter from which the necrosed bone has been excised is left wide open for drainage. No drain or pack is inserted. Once the infected material has been removed hæmorrhage is rarely troublesome. If hæmorrhage persists for more than a few minutes after the operation is completed, the wound may be packed loosely with Gelfoam, Oxyeel, or similar hæmostatic which will be absorbed without residue after some hours. Owing to the brisk and continuous hæmorrhage during operation, an anæmic or otherwise debilitated patient may require blood transfusion.

Recovery after a thorough operation is usually rapid. The temperature will usually be stabilized at normal on the first or second day after operation. Penicillin is continued at the same level, and syringing of the mouth is carried out with warm saline or weak antiseptic night and morning and after each time food is taken. Hydrogen peroxide is not used for syringing. Penicillin lozenges dissolved slowly in the mouth may be of value. The relief of trismus will be helped by the daily application of heat therapy. Fistulæ on face and neck will begin to heal almost immediately. Provided his general condition remains satisfactory, discharge of the patient from hospital about seven days after operation may be expected.

When pathological fracture occurs, or there is loss of cross-section of mandible, immobilization of the parts should be effected. When teeth are present cap splints with connecting bars are constructed and intermaxillary fixation made. If the gap to be bridged is not too great, healing with calcification should occur in six to ten weeks. If non-union occurs, a bone graft may be inserted no sooner than 9 to 12 months after operation. Splinting to give rest may be of value in cases of great loss of mandibular body without fracture. Deformity may be reduced to a minimum, making the restoration of function and appearance by means of a prosthetic appliance more straightforward.

When the mandible is edentulous, fixation is complicated considerably. A lower acrylic splint may be fitted over the edentulous areas

and lashed into place with mandibular circumferential wiring. Two or three soft stainless steel wires of 0.35 mm. diameter are passed around the body of the mandible by means of a bone awl, and are tightened over the splint. This splint, which will have been prepared with hooks or eyelets, is then fastened to a cap splint in the maxilla. If the maxilla is edentulous, an upper splint may be constructed and wired to the maxilla. Alternatively, the patient's own denture may be used. Two or three separate wires are passed through the splint or denture from the buccal aspect, through the alveolar process, and made to emerge on the palatal aspect of the splint or denture. Each wire is fastened tightly and the splint or denture is thus firmly attached to the maxilla.

When condyle loss has occurred, it is essential to maintain the function of the mandible during the healing stage to avoid the risk of ankylosis. Splints should be applied and intermaxillary elastic fixation adjusted so that deviation is avoided while allowing movement of the mandible during speech and mastication. After the corrective elastics are removed there may still be a deviation of the mandible to the affected side on opening. If teeth are present in the mandible, cap splints with a vertical training flange as described by Kelsey Fry, Shepherd, McLeod, and Parfitt (1942) should be fitted on the unaffected side. This will train the muscles to overcome the deformity.

When two condyles are lost, the mandible falls back with great deformity. It is therefore necessary to hold the mandible forward during the healing stage. Unfortunately, such bilateral cases will almost invariably have been associated with an infection of the whole body of the mandible with loss of all teeth and alveolar process. Circumferential wiring is unlikely to be successful in such circumstances. For the same reason, fixation with intra-osseous pins of the Roger-Anderson type leading to an external appliance and attached to a maxillary splint or plaster headcap is contra-indicated. Attempts to introduce such methods of fixation soon after operation are likely to result in further infection of the bone. A similar limitation

is met with in edentulous cases of pathological fracture and loss of whole cross-section of body of mandible associated with generalized infection of the bone. In such cases the fractured bone ends must be allowed to approximate and the jaw be supported by a chin bandage. No solid food may be taken for three to four weeks, or until some clinical signs of union are noted. The resulting deformity may be minimized by the insertion of a bone graft at a later date.

Severe cases may occasionally be encountered where there is so much bone loss in whole section that approximation of the bone ends is impossible. In such cases it is desirable to maintain as well as possible the shape of the soft tissues which are unsupported by bony framework. This may be done by means of an acrylic splint which is made to fit into the gutter of soft tissue and is of the approximate shape of the lost mandibular bone. Fixation is a difficulty. The splint may be constructed to fit firmly against either the upper teeth or artificial denture, or an upper cap splint with vertical post or flange extensions. Used with a chin cap or bandage, this so-called "gutter splint" may be held down in position. A complication of such treatment is that the splint must be fitted as soon as possible after operation, preferably after a matter of a few hours only. If fitting is delayed, contraction of the soft tissues takes place and the cosmetic result is impaired. Unfortunately, the fitting of the splint will hinder to some extent free drainage of inflammatory exudate. If operation has been thorough, that will not be a serious matter. But if small portions of infected bone have been inadvertently left *in situ*, pain and further swelling will soon result from the pressure of the gutter splint. Supplementary operation will then be necessary, and the splint may have to be extensively altered or discarded. If cases requiring gutter splints should have teeth on both sides, metal cap splints may be constructed. The gutter splint may then be processed on to a metal bar connected by screw plates to the cap splints. The acrylic is made to contact the upper teeth or splint, and bolting together of upper and lower splints completes a rigid fixation. This is maintained

until a bony framework is laid down. The gutter splint may be removed for daily cleansing (Fig. 7).

Gutter splints require to be trimmed from time to time as new tissue is filled into the gutter. The places to be trimmed may be



Fig. 7.—Fixed splint with removable gutter splint.

determined by observation of pressure spots on the mucosa.

Prosthetic restorations should be made in all cases as soon as immobilization is no longer required. Restoration to full function with balanced occlusion may then be instituted before the patient adds to his deformity by developing unilateral mastication or a so-called "bite of convenience".

3. Subacute Spreading Stage.—When a subacute spread takes place it is advisable to clear out infected bone and involved teeth at the earliest possible moment. To delay may mean increased spread with further loss of teeth and alveolus, and greater deformity. To treat by means of incisions alone may arrest the spread of the disease, but radical operation is advisable as soon as possible. It is the present writer's contention that radical operation for excision of all infected bone in the subacute spreading stage of osteomyelitis may be performed with complete safety using the intra-oral approach. As Henry (1946) puts it: "The advent of first the sulphonamides and then penicillin has changed our conception of the disease, and has given radical surgery a degree of safety that was not formerly contemplated."

Details of the operation are essentially the same as described for chronic cases. If the operation has been thorough, no further surgical interference will be necessary. Splinting and prosthetic restoration may be required as previously described. Special care must be

taken if gutter splints are fitted after subacute infection owing to the danger of blocking drainage and causing a resurgence of the infection. In doubtful cases holes may be drilled through the acrylic splint to facilitate drainage.

SUMMARY

1. Suppurative osteomyelitis of the mandible is defined shortly.

2. The incidence of osteomyelitis is discussed with particular reference to the question as to whether the Chinese have a racial susceptibility towards the disease. Further study of this question is necessary.

3. A description of the disease is presented.

4. Treatment of osteomyelitis in its acute, subacute spreading, and chronic stages is discussed, and the writer's method of treatment is described.

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METALLURGY, MECHANICS, AND ECONOMICS OF DENTURE-BASE ALLOYS

By E. A. SCHOOLDEN

ALTHOUGH the modern world has already seen gold supplant silver as the chief medium of exchange, modern dentistry is still in the midst of a transition period during which certain baser metals are slowly replacing the more noble ones, particularly gold.

This is hardly surprising when one realizes the gradual increase in the cost of gold as a basic raw material. Prior to the adoption of the gold standard of currency in 1816, gold had sold at about 85 shillings per fine ounce for about a hundred years; 22-carat gold is at present quoted at around 297 shillings per ounce.

Gold clasps and wire for the retention in the mouth of primitive types of partial dentures and bridge-work, it is recorded, were used before the Christian era by the Phœnicians and Etruscans (Skinner, 1950). The swaged, or struck-up gold plate with carefully chased lingual festooning, accurately fitted tube teeth, and immaculately soldered and contoured plate clasps held pride of place during the last century.

It has, however, in the course of time given way to the one-piece cast gold skeleton denture which, if lacking somewhat in the type of craftsmanship requiring considerable manual dexterity, possibly requires a little more skill

in the use of scientific method, and in design is clinically more sound and hygienic.

White Golds.—The continual rise in the cost of gold since the monetary standard was abolished, coupled with the increasing popularity of the one-piece casting, influenced manufacturers to introduce "white gold", which is essentially a palladium alloy. Advancement in methods of refining had made palladium so plentiful that its cost was roughly half that of yellow gold.

It was consideration from the æsthetic rather than the economic standpoint which popularized the white alloys with American patients, however, who considered them superior in this respect. In this country probably the reverse opinion obtained.

Present-day palladium/gold/silver casting alloys have slightly higher tensile strengths; they fuse at somewhat higher temperatures than contemporary yellow gold alloys, and are lighter in weight.

Nobility and Passivity.—Gold and platinum have always held first place for oral restorations because of their nobility, i.e., their resistance to tarnish or corrosion from mouth fluids. This nobility depended upon two factors: (1) a low affinity for oxygen; (2) a low solution potential towards electrolytes. Oxides are not formed

directly in air or oxygenated solutions, and those formed indirectly are easily decomposed below red heat. The metals individually will decompose steam. These metals are amongst the lowest of the electromotive series, which indicates a lack of ability to produce many ions in molar solutions of their salts.

Several other metals and their alloys are found to develop *passivity* under certain conditions. Chromium, aluminium, nickel, and cobalt, when exposed to oxygen diluted approximately as in air, become passive after a very short time because of the specific nature of their surface films. The layer of oxide, perhaps only a few molecules thick and indistinguishable to the naked eye, is very hard. The molecules are very closely packed and the atoms so orientated that further oxygen atoms or electronegative ions cannot easily penetrate to the parent metal beneath. There is strong affinity or electrostatic force between the atoms of the metal and those of its surface film. Incidentally, the difficulty of successfully soldering aluminium and stainless steel is hereby accounted for.

By comparison, iron and iron rust behave quite differently. The rust, which is chiefly hydrated ferric oxide ($2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$), offers little, if any, protection to the metal. These molecules are relatively large, adhesion poor, and the rust easily falls away to reveal more iron for further chemical action, which is also considered to be partly electrolytic (Durrant, 1939). Iron may be rendered passive by immersion in a strong oxidizing acid such as nitric, but the oxide layer is so weak that the slightest abrasion will remove it. Copper, silver, and zinc, used in dental cast-gold alloys to increase the properties of hardness, colour, and fluidity, are also open to electrochemical activity unless adequately protected. Tamman states that protection from corrosion is complete only when the number of noble-metal atoms is equal to or exceeds the number of base-metal atoms in the space lattice of the alloy (Skinner).

Stainless Steel.—Iron, because of its wide distribution in its native state as red and brown hematite (Fe_2O_3 , and $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$), is by comparison with gold very inexpensive.

The iron/carbon alloy steel has high tensile strength, toughness, and hardness, but because of its chemical activity is quite unfit for use in the mouth. It was not until the accidental discovery of stainless steel in 1913 by Harry Brearley, of Sheffield, that its use in the making of dental appliances became a possibility.

The stainless property of the alloy was due to the addition of two of the aforementioned metals, namely chromium and nickel. In the steel for dental use the former element is used to passivate the alloy whilst the combination of the two controls crystallization transformations during temperature changes in manufacture.

The application of steel to dentistry required the manufacture of an alloy which could be worked in a dental laboratory with its limited mechanical apparatus. Hot-working was impracticable, which ruled out the martensitic varieties such as the tool steels which are hardened by quenching, and which in any case required very accurate heat treatment in order to acquire maximum stainless properties.

The corrosion resistance of any metal or alloy used in the mouth must be very high. The oral fluids often hold in solution hydrogen sulphide, and contain in addition to the organic compounds ptyalin, mucin, protein, and potassium sulphocyanide, the inorganic salts, NaCl , KCl , $\text{Ca}_3(\text{PO}_4)_2$, $\text{Mg}_3(\text{PO}_4)_2$. These latter electrovalent compounds may be dissociated in solution and by hydrolysis affect the ionic concentration of the secretion. Average $[\text{H}]^+$ of normal saliva which changes with that of the blood varies from $\text{pH } 5.8$ to $\text{pH } 7.6$ (McDowall, 1946). The possibility of electrolytic corrosion due to intimate contact of dissimilar metallic pairs cannot therefore be lightly disregarded.

Metallurgy.—The most stable form of stainless steel sheet capable of cold-working within the limitations of the dental laboratory, and suitable for dental purposes, was found to require 18 per cent of chromium and 8 per cent of nickel to be added to an iron/carbon alloy. These percentages give adequate protection and result in a steel which is austenitic.

Metallurgically, austenitic steel is a solid solution of the intermetallic compound cementite

(Fe₃C) in ferrite (pure iron), from which martensite may be produced as a decomposition product during a specific temperature range and rate of cooling. The addition of nickel has the effect of lowering the temperature at which this decomposition takes place. Chromium, in addition to its anti-corrosive property, slows down the rate of this transformation. Sufficient quantities of these two elements ensure that the decomposition temperature is so depressed that no martensite is formed. Such an alloy will be completely austenitic and comparatively soft and ductile.

Unlike martensitic steel it cannot be hardened by reheating and quenching. This property is obtained from distortion of the lattice by the induced strain of cold-working, which also breaks up large crystals into small ones, thus keying the slip planes and elongating them in the direction of the working stress.

Mechanical Properties.—Occasional annealing (resoftening) by pre-heating to a dull red and slowly cooling in an electric furnace, or, alternatively, a bath of fused barium chloride, is needed to restore the latent plasticity of the steel, otherwise further working may result in fracture. As supplied by the depots in sheet form of 0.006 to 0.03 in. thick, it has a B.H.N. of 163, which after working may increase to as much as 370. Tensile strength is about four times that of the gold alloys, which are about twice as heavy volume for volume.

The stability of stainless steel can very easily be affected adversely if great care is not taken in re-heating processes which includes welding. Chromium and nickel individually combine chemically with the carbon present if high temperatures are held for more than a short interval of time, their carbides being precipitated at the grain boundaries. Loss of chromium means loss of passivity, leading to intergranular corrosion or "weld-decay". High temperatures also increase the formation of surface oxides. These can be removed by pickling in 50 per cent hydrochloric acid to which there has been added a small percentage of nitric acid. This solution loosens the oxides and dissolves them, but must be restrained from etching the virgin steel below

them by the addition of glue-size or "Picklelette".

As with sheet gold, swaging of stainless steel requires accurate sand moulding of dies and counter dies, which for preference should be harder and tougher than pure zinc and lead. Dies of Mazak alloy are sometimes used with lead/antimony/tin "frogs" and counters. Unlike gold, which can be malletted and swaged in a small hand-press, stainless steel requires a hydraulic machine capable of delivering a sustained pressure of 50 tons per sq. in. Clasps, backings, and finishing beads are attached by means of an electric resistance spot-welder.

"After-treatment" consists of stoning of the weld-spots prior to finishing with a hard rubber wheel, polishing, and buffing. Polishing, moreover, may now be carried out electrolytically (Zentler Gordon, 1952).

Casting.—The whole operation is, nevertheless, quite lengthy and laborious. It has tended to become the specialized work of technicians who do nothing else. It is not surprising, therefore, that attempts at casting methods have been investigated, with the possibility that the time factor and much of the hard labour could be effectually reduced.

Cast stainless steel has not been a possibility chiefly because of the inadequacy of ordinary casting methods to exclude air from contact with the molten metal. Oxidation is excessive at the melting point which is high enough to demand the use of oxy-hydrogen or oxy-acetylene gases. It was obvious that the iron content was the "nigger in the woodpile". Much greater success has been obtained from the use of base-metal alloys of the non-ferrous type. These are chiefly composed of cobalt, chromium, and nickel, with smaller percentages of molybdenum and/or beryllium, tungsten, and manganese. The precise formulæ are not usually disclosed.

They are marketed under various trade names, such as Croform, Svedion, Megallium, etc., and would seem to be descendants of Stellite and Vitallium. The apparatus required is fairly expensive and the technique requires specialization. An exception to this is an alloy containing aluminium, with a technique which closely approximates to that of cast gold alloy

and therefore is more suitable for use in the dental laboratory of the general dental practitioner (Boswell, 1952). (Fig. 1.)

Briefly, the chief characteristics of Virillum, as the alloy has been named, are freedom from a long laborious technique and expensive new

together as modifying agents to the main constituents, Co 67.9 per cent, Cr 24.1 per cent, Mo 5.3 per cent, and Ni 1.4 per cent.

The manufacturers stress the fact that no trace of beryllium is present, this element being particularly destructive to human cells (The Virillum Co., 1952). Tissue tolerance and toughness have been proved by its use in the field of orthopaedics. An instance is quoted where alloy staples were hammered repeatedly into the epiphyses of long bones and which were still in operation after many months.



Fig. 1.—Full upper base pattern, showing recommended method of spruing.

apparatus, especially in the finishing of the castings, which have not the brittle hardness usual to alloys of this type. B.H.N. as cast is 291. No heat-treatment is required if the casting cylinder is allowed to bench cool for half-an-hour following casting, which is best carried out on a vertical centrifugal machine.

Although it is claimed to be austenitic like dental stainless steel, this cannot be strictly correct, as austenite, as has been previously described, is a solid solution of an iron/carbon compound in iron. The new alloy, however, is apparently non-ferrous. Its composition as quoted by Boswell (1952) contains in the main, chromium, cobalt, and molybdenum, with minor proportions of carbon, magnesium, silicon, aluminium, nickel, and columbium (niobium). Whilst Trainin (1952) shows the formula to contain a combined percentage of 2.7 of W, Fe, Mg, Si, C, and Al, bracketed



Fig. 2.—A skeleton part-upper framework, emphasizing compactness of design.

Clinical and laboratory tests have been carried out extensively with very satisfactory results. Tests undertaken at the Lister Institute of Preventive Medicine include the immersion of castings in solutions of 0.1 per cent lactic acid, human serum, and red cells in saline. These samples were regularly shaken and kept at an incubation temperature of 37° C. After three months no loss in weight was shown by a microbalance. The alloy will not inhibit the growth of fibroblasts and osteoblasts. Its freedom from cytotoxicity is further instanced by its favourable performance in hip-joint replacement.

Additional attractive qualities are denoted by the ease and speed of finishing, in that sand-blasting to remove oxide is unnecessary, as is a high-speed grinding and polishing lathe. Ductility, toughness, and elasticity are such it is claimed, that a cast wire may be bent

to an angle of 90° and straightened several times without fracture. In the field of partial dentures these properties approach closely to the ideal. (Fig. 2.) It has a high affinity for gold and gold solder. Its fusion temperature is somewhat lower than contemporary base metal alloys and is around 1280°C . Cooling

licenses or require any form of agreement to be entered into such as is the practice with certain manufacturers of casting alloys of a similar nature.

SUMMARY

From the history and economics of gold as a medium for restorative dentistry because of its anticorrosive properties, various other alloys are described. The tendency from the beginning of the present century seems to point to a

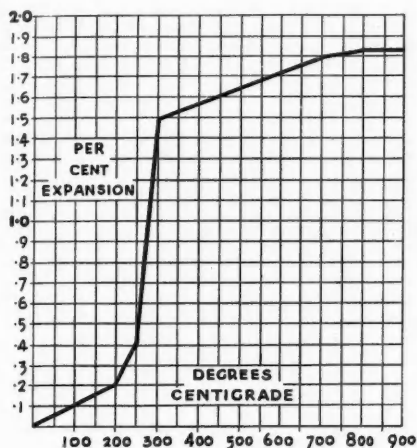


Fig. 3.—Characteristic curve of high-heat investment compound.

contraction is in consequence a little less (1.8 per cent).

Oxy-acetylene gases directed through a rose-tipped blow-torch are needed, and an oven capable of reaching 800°C . This is the temperature the mould must reach before heat-soaking for thirty minutes, allowing three and a half hours after the wax burn-out. A specially bonded high-heat refractory is available which sets in half-an-hour, with an accurately compensating thermal expansion. (Fig. 3.)

The time factor in man-hours, it is affirmed, is equal to that of cast gold technique. Either investment-model or wax-withdrawal methods can be used with equal facility, but casting through the model using special tapering sprue-formers is recommended, as both time-saving and giving maximum precision. (Fig. 4.) Excess buttons may be recast and scrap metal is purchased by the company, who do not issue

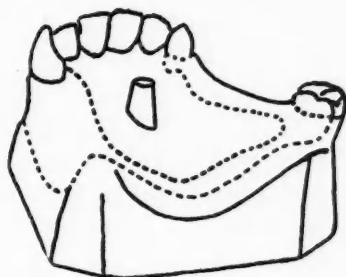


Fig. 4.—Master model showing pencilled outline and specially shaped sprue-former fixed in centre of design.

slow transition from gold-like alloys to an increasing use of chromium-steel for wrought bases and chromium-cobalt for their cast counterparts. The corrosion resistance of these baser metals is achieved by virtue of the passivity of their surface films. One of the newer alloys is described which has a technique closely approximating to that of cast gold work.

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DENTAL BOARD OF THE UNITED KINGDOM

Chairman's Address at the Opening of the Sixty-fourth Session

May 6, 1953

GENTLEMEN,

It is with a deep sense of loss, mingled with gratitude for the important share he took in the design of our educational structure, that I have to record the death of Sir Holburt Waring on Feb. 10 this year. With that event we have lost the last of that group of eminent men who thirty-two years ago remained to guide the first steps of the Board they had helped to engender. Others have recorded the career of the surgeon who, after being Dean of the Medical Faculty of the University of London and for many years representative on the General Medical Council of the Royal College of Surgeons of England, became Vice-Chancellor of the University and President of the College. It is for me to recall once again the great benefit which he conferred upon the dental profession when, with Sir James Hodsdon and Sir Arthur Chance, he came to the Board as one of the original members appointed by the General Medical Council.

Sir Holburt was our first Treasurer and Chairman of the Finance Committee and as such was kept in close contact with all our activities. He was also a member of the Educational Grants Committee and took a personal interest in the selection of the Board's bursars. He held these appointments continuously for eleven years, and it would be difficult to overestimate the extent of his influence upon every aspect of the Board's work during this formative period. His special care and study were, however, applied to fostering the development of the Dental Schools. To this work he brought an inexhaustible fund of administrative experience and provided a constant stimulus, which, supported by the large sums made available by the Board, often at his instigation, contributed so greatly to the remarkable advances which took place in the structure of dental education during these years.

It is a measure of the value which his colleagues placed upon his work that, when in 1932 his appointment to the General Medical Council terminated, recourse was had to every available expedient—including a case argued before a Judge in Chambers—in an attempt to prolong his membership of the Board. The final assessment of the debt we owe to him is, however, only emerging with the passage of time, and each of us here can be grateful for the example he set us of disinterested and upright public service.

I have also to record with regret the death on March 16, at the age of 74, of Mrs. Scott, who on her retirement in 1945 had been Housekeeper in this building for over thirty years. Mrs. Scott belonged to that almost vanished race of upper servants who were proud to devote their lives to their employers' welfare, and those of us who profited from it will not readily forget the unfailing consideration and efficiency with which, in more lavish days, she ministered to our creature comforts, nor belittle the affection and esteem in which she was held by successive generations of our colleagues and staff.

I am reminded to-day of the May Session of the Board eight years ago, which happened to coincide with the end of the Second World War, at least on this side of the globe. At that time we were hoping for a period of tranquillity and refreshment, and we rightly believed that we were on the threshold of great achievements.

On this occasion we are looking forward to the Coronation of Our Queen and the flowering of a new Elizabethan age. It is a season of rejoicing and dedication. We do rejoice and pledge ourselves to her service and the service of the State in the development and evolution of our profession. You will be happy to hear that the Board have been honoured by an invitation to be represented in the Abbey Church of Westminster at the Coronation Ceremony, and I hope it is your pleasure that I should represent you there.

At this session it is usual for me to refer to the state of the Register. The number of names in the Register on the last day of March of this year was 15,739. I have chosen this date because for various administrative reasons it gives a more accurate indication of the true fluctuations of the Register. This total is the highest yet recorded, but we should beware of complacency, since it represents an increase over the total at the end of March in 1952 of only 24 names. The corresponding increase during the preceding twelve months had been 209, and in the twelve months before that, 357, so that the figures really reveal an alarming decline in the rate of expansion of our profession. The number of British graduates and licentiates registered for the first time during this period is not so much smaller than the figure for the previous year—568 compared with 587—and it seems likely, therefore, that we are beginning to experience the long-deferred effect of the high average age of practising dentists upon their rate of retirement.

Looking a little further ahead—but remembering always that statistical prognostications are very often overtaken by events—analysis of the Register by age suggests that the average rate of retirement over the next ten years is likely to exceed six hundred a year. Moreover, since entry into the dental schools has declined by nearly 22 per cent during the past five years, additions to the Register from this source must be expected to drop from over 600 in 1952 to less than 500 in 1957. So far, therefore, from attaining the goal of 20,000 thought necessary by the Teviot Committee, we may be unable over this period to maintain a Register of 15,000 names.

I think you will agree that it is our particular duty as members of this Board to reflect very carefully on the significance of these figures and the serious trend they indicate towards the limitation of available dental service in this country. Many will remember an Address to the Board by my predecessor, Sir Francis Dyke Acland, in which he put forward his view that "the aim of all our work is twofold—to guard the public from being practised upon by incompetent persons, and to see to it that there are a sufficient number of persons who will bring the most efficient dental treatment and advice within the reach of all who need it . . .".

Since these words were uttered much has been done in the effort towards fulfilment of this twofold aim. The schemes for financial aid to dental schools and particularly those for providing bursaries for approved students, introduced in the early years of the Board's existence, stimulated the great development of dental education and the increase in the size of the dental profession which have taken place during the past thirty years. Now the

responsibility of the Board for the numerical strength of the profession is shared. The Minister of Health has a very heavy responsibility to provide an adequate dental service for all who need it, and the British Dental Association, having become the representative organization of the dental profession, bear a corresponding and complementary public responsibility to further that end.

It is self-evident that 15,000 men and women, even if that figure could be maintained and if all were active, could not possibly provide the whole dental care needed by 53,000,000 people. At the same time we are told that many dentists are underemployed. If this be true, and the reduced cost of dental services in the National Accounts suggests that it may well be so, then there is clearly something radically wrong in our approach to the problem of providing dental care for everyone.

The remedy is easy to prescribe, difficult to administer. If the children were all to receive efficient and complete dental care with proper advice and training in oral hygiene, not only would the foundation of their own personal dental health be laid but the teaching and experience they had undergone would establish an enduring habit of concern for their continued dental health. A demand would thus be created which as soon as the children grew up would overtax the resources of the existing profession and show the deplorable lack of dental manpower in its true proportions. It takes many years and a concerted effort to bring about a material increase in the numerical strength of a profession. It is therefore useless to adopt a policy of *laissez-faire* even though it be stiffened by an attempt to re-direct some of the limited resources towards the children. It is not even enough to provide a full and complete dental service for the children unless at the same time we have in mind a means for securing their continued care as they grow up.

This year, as I have said, provides an opportunity for a new approach to these old problems, a chance to get rid of shibboleths that are out of date and to form a policy for our own generation and for the future. This policy must be one of co-operation and co-ordination. We have an assurance from the Minister that new dental legislation will be brought before Parliament at the earliest opportunity. We have a united British Dental Association, and this Board is presumably to undergo a process of reincarnation and emerge as a body, not only more representative of the profession, but with its responsibilities increased and directed more specifically towards securing that there is a "sufficient number of persons who will bring the most efficient dental treatment and advice within the reach of all who need it". The dental schools, who will be widely represented on the new Council, are, with Treasury support through the University Grants Committee, forging a magnificent academic tradition, and throughout the country there are already thousands of dentists trained in this tradition whose one desire is to be fully occupied in serving the public in their own profession with efficiency and in reasonable security, so that they may be entitled to the respect of their fellow citizens. A dental consultant service is becoming a reality in the hospitals and everyone is anxious to banish dental disease. It is only necessary for every dentist in practice and for all these highly efficient and individually well-organized departments of dental life and activity to work together in harmony to achieve the supreme object of bringing dental health to the whole community, and honour, security, and contentment to the profession.

At a time when it has been necessary to raise the retention fee by 8s. to £2 10s. a year, it may not be

inappropriate if I cite a further passage which is to be found in the Address of my illustrious predecessor from which I have already quoted. Speaking of misapprehensions which appeared to exist about the nature of the annual retention fee, he said that those who pay this fee "have no right to a return for their money in any particular direction or, indeed, at all, the fee being in the nature of a tax levied by the State upon certain persons who possess a monopoly of practising and not in the nature of a subscription to a society or association". It is nevertheless very natural and appropriate that the profession should be interested to know what becomes of the money they pay. I may therefore recapitulate and say that the special expenditure of the Board on such public matters related to dentistry as, for example, postgraduate education, dental health education, and the compiling of a film library has been much reduced as compared with the heavy special expenditure of the Board in pre-war years. Apart therefore from building up the necessary reserves which have become somewhat depleted by the restoration of this building and by other non-recurrent post-war expenditure, most of the Board's income is now devoted to administering the Dentists Acts to which the profession owe, amongst other things, the virtual monopoly of dental practice and the measure of self-government they possess.

Since, however, we have a further assurance that the Minister intends to introduce new legislation affecting the use of Dental Board funds and laying other duties upon the Board's successors, it would, I believe, be inappropriate for us to seek the approval of the Privy Council and Parliament for raising the retention fee to the maximum of £5 permitted by the Act for the purpose of making new grants to stimulate recruitment or for any similar public purpose connected with dentistry, and unless the Bill were postponed *sine die* I should not suggest to you that we ought to consider any proposals of this nature.

You will have observed from the papers before you that the Discipline Committee have recently given much thought to the problem of revising the Warning and Important Notices issued to every practitioner when he is first registered and from time to time sent out to all those whose names are in the Register. The Warning Notice was adapted in 1922 from the Notice then issued by the General Medical Council, while the Important Notice was drawn up two years later as a supplement to the Warning Notice and a guide to its application to the dental profession. Additions have been made to these notices and they have been amended piecemeal as seemed necessary to meet specific issues, but it has become clear that they do not now completely fulfil their primary function of providing a ready source of reference for practitioners on those aspects of professional conduct with which they are particularly concerned. The Discipline Committee have therefore sought to re-cast the Notices and produce in the form of a single notice information couched in non-legal language concerning those offences against professional good conduct which are most frequently brought to our notice. A draft of the Notice produced by the Committee has been circulated to us for our consideration at this session.

In an earlier part of my Address I referred to the happy auspices under which we have come together on this occasion, and for a body such as this, responsible for maintenance of a high standard of professional conduct, it is indeed a happy omen that at this session, for the first time, I believe, in our history, there are no new disciplinary cases to be brought before you.

SOCIETY NOTES

FEDERATION DENTAIRE
INTERNATIONALE

Annual Meeting, Oslo, Norway

July 26 — Aug. 1, 1953

PROVISIONAL PROGRAMME

Saturday, July 25. 2 p.m.: Meeting of the Council.

Sunday, July 26. 10.00 a.m.: Meeting of the Council.

2 p.m. Meeting of the Council. Evening. Informal Reception by F.D.I. at Hotel Bristol.

Monday, July 27. 10.30 a.m.: Official Opening. 2.30 p.m.: General Assembly. Evening: Reception by Oslo Municipality at the Town Hall of Oslo.

Tuesday, July 28. Meetings of the Commissions. (Open Meetings are for all visitors to attend. Closed Meetings are for business discussions between Members of the various Commissions.)

Morning: 10.00 a.m.—12.30 p.m.: Open Meeting: Scientific Commission. Title of subject for discussion: "Symposium on Sugar and Dental Caries". Members taking part: Panel will be almost entirely Scandinavian.

Closed Meetings: Commissions of Education, Oral Health, Armed Forces, and External Relations.

Afternoon: 3—5.30 p.m.: Open Meeting: Armed Forces Commission. Title of subject for discussion: "Report regarding the existing collaboration between Civil and Military Authorities concerning the organization of Dental Health Care".

Closed Meetings: Scientific Commission, and Commissions of Education, Oral Health, and External Relations.

Evening: Free.

Wednesday, July 29. 10.00 a.m.: Closed Meetings of the Commissions. 2.30 p.m.: Joint Open Meeting, Oral Health and Scientific Commissions. A Panel discussion on Fluoridation.

Evening: Reception at Akershus Castle by Norwegian Government.

Thursday, July 30. All day: Excursions with Lunch given by the Norwegian Dental Association.

Evening: Free.

Friday, July 31. 9.30 a.m.: Meeting of the Council. 2.30 p.m.: Report on Public Dental Services by Dr. Ramm (Oslo) 20 Minutes, to be followed by Openers—10 minutes each.

Evening: Banquet at Royal Norwegian Sailing Club.

Saturday, August 1. 11.00 a.m.: General Assembly.

Sunday, August 2. 10.00 a.m.: Council Meeting.

INSTITUTE OF BRITISH SURGICAL
TECHNICIANS (INC.)
(Dental Section)

THE Dental Section held its usual monthly meeting at the Eastman Dental Hospital on Tuesday, April 14, when an interesting lecture was given by Mr. Frank Popper, L.D.S. R.C.S. (Eng.), M.S.D. (Northwestern), of Johannesburg, on "Functional Balanced Dentures—Introducing a New Posterior Tooth Design".

310

In his introductory remarks Mr. Popper stressed the duty of providing the patient with completely functional dentures to enable him to eat efficiently, and, basing his theory and technique on Newton's laws of motion and the laws of forces, he indicated the main movements producing the masticatory processes and the necessity for incorporating the individual condylar path angulation in complete denture construction in order to achieve the aim of producing good balanced dentures. To produce smooth masticatory movements and a design in harmony with anatomical and physiological considerations, a cusplless pattern of posterior tooth design was indicated which incorporated the mechanical principles of (1) the chopper and the board and (2) the pestle and the mortar mill. Describing the Christensen Effect and its employment in the technique he indicated how the condylar path was developed directly on the plain line indicator with the specially designed posterior teeth previously described.

Mr. Popper's remarks were illustrated by lantern slides and blackboard diagrams and a lively discussion ensued which showed that his exposition of this new technique had been followed with close attention and interest.

Mr. E. G. Emmett thanked the Committee and those responsible for the arrangement of this last lecture of the season and intimated that the next meeting would be open to members only. Arrangements were now under consideration for the new series of lectures in the Autumn.

In conclusion the Chairman, Mr. J. Boswell, thanked Mr. Popper for describing his new system and complimented him on his fine lecture.

FOR RESEARCH WORKERS

THE American Institute of Dental Medicine, 2240, Channing Way, Berkeley 4, California, U.S.A., have announced the publication of an atlas on *The Skeletal Development of the Rat, Normal and Hypophysectomised*. It is in two volumes and written by Herman Becks and Herbert Evans of the University of California. The book is limited to 300 copies only, and the price is \$48.00.

THE PROCEEDINGS OF THE BRITISH SOCIETY OF PERIODONTOLOGY

President : G. H. LEATHERMAN, F.D.S. R.C.S. Eng.

Hon. Secretary: H. THOMSON, L.D.S. R.F.P.S. Glasg., H.D.D. R.C.S. Edin.

53, Portland Place, London, W.1.

Vol. III, No. 6

June, 1953

AN ORTHODONTIC VIEW OF OCCLUSION IN RELATION TO PERIODONTAL PROBLEMS

By C. F. BALLARD, F.D.S. R.C.S., M.R.C.S., L.R.C.P.

Head of the Department of Orthodontics, Institute of Dental Surgery, London University

MR. PRESIDENT, LADIES and GENTLEMEN:
In spite of the fact that I have been asked at short notice to speak to you to-night owing to the unfortunate illness of Miss Smyth, I am nevertheless aware of the honour you have done me. I hope that what I say will be of interest to you, although I am not as prepared as I should like to be with illustrations.

Orthodontists must have some concept of what is a functional occlusion: a concept of what the periodontists would like produced, and of what the conservative men would like from the point of view of caries control. I may be open to criticism when I suggest that you have not answered many of the questions that arise in the orthodontist's mind. To-night I also want to show you that there are limitations imposed on us by inherent characteristics in our patients, and that it is not possible for us to produce a normal functional occlusion in every case. In many only a compromise is stable. It is only by discussion between all branches of the profession concerned in the maintenance of a full dentition that a decision on the best compromise in the individual case can be reached.

My concept of a sound functional occlusion is two complete arches of teeth, perhaps without third molars, with the accepted cuspal interdigitation, having a definite axial relationship to one another and to occlusal stresses and with all contacts firm. I believe that the loss of even a single tooth anterior to the third molars spoils the delicate balance, and may be the beginning of the end of that dentition. A high percentage of orthodontic cases present for treatment for æsthetic reasons, but I

think in the majority of cases function must be our first consideration.

Dental irregularities are on the increase amongst civilized populations, and there are two main reasons for this. The position of the dento-alveolar structures is dependent on skeletal and soft-tissue morphology, both of these being inherited. With the increasing mixing of ethnic groups, variations of soft-tissue and skeletal morphology are coming together and forming varying degrees of misfit. This is outside our control, and is the first reason for an increase of dento-alveolar abnormalities in modern populations. The second reason is probably that forms which two or three hundred years ago would have been biological inferiors and not compatible with survival are now living to perpetuate the degeneration. Wallis recently brought this view forward with evidence to support it. As he said, it will be remembered that in an examination of skulls of three or four hundred years ago there was a far lower percentage of dento-alveolar irregularity. It will be remembered, however, that in those days there was a far higher percentage of deaths within the first year. Those who died may have been the biologically inferior forms which are producing types such as our Class II, Division I, to-day. It is these inherited variations which impose the limitations on our treatment, and they are the reason why we cannot produce a normal occlusion in a high percentage of our orthodontic cases.

Firstly this evening I want to give you the orthodontic concept of how the occlusion develops. In the infant and the edentulous

individual (Fig. 1) we have a representation of the physiological balance for which the presence of the dento-alveolar structures is quite unnecessary. In the infant the dento-alveolar structures grow vertically from dental



Fig. 1.—Lateral radiograph of endentulous individual demonstrating posture of mandible in physiological balance.

bases the relationship of which is determined by the inherited skeletal pattern, and they are moulded as they grow into occlusion by the soft-tissue morphology which is likewise inherited. It is a fundamental concept of orthodontics that the dento-alveolar structures as we see them, whether normal or abnormal, are in balance in soft-tissue behaviour, therefore during the development of occlusion quite wide variations of dental base relationship can be associated with a normal occlusion if the soft-tissue behaviour directs the dento-alveolar structures, during their vertical growth, in the right direction. Many abnormalities of arch relationship are not the result of any skeletal abnormality but are the result of abnormalities of posture and behaviour of the

tongue and lips. As we shall see, these postures and behaviours are inherent and very difficult to change or control, and are of great significance in determination of prognosis in orthodontics. Not only does soft-tissue posture and behaviour determine the lateral and antero-posterior position of the dental arches, but it also determines vertical development of the dento-alveolar structures and the position of the occlusal plane. As J. R. Thompson has said, the dento-alveolar structures do not contribute to the height of the face. The true concept is that they merely grow vertically to close the intermaxillary space, and the inherent vertical growth of the dento-alveolar structures is balanced at occlusal level by occlusal forces. This again is a fundamental concept which if not accepted may lead to 'bite-raising' practices which are physiologically unsound and can be proved to be so by simple cephalometric analysis of face height and occlusal height.

I should now like to discuss in detail the labial segment relationship. Fig. 2 illustrates the normal or mean for an Anglo-Saxon population. This occlusal relationship is

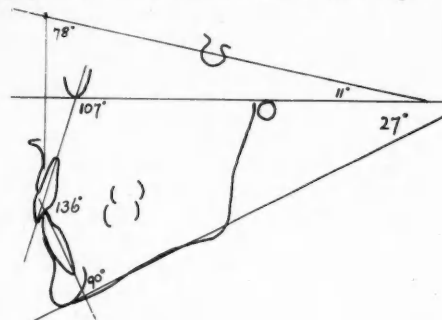


Fig. 2.—Tracing showing mean values and "normal" incisor relationship.

established as the result of vertical development of the labial segments from a normal dental base relationship in normal soft-tissue posture and behaviour. It will be noted that the incisal tip of the lower incisor occludes against the middle third of the lingual surface of the upper incisor, the axial inclination between these teeth being somewhere between 130° and 140° in "normal" occlusion.

There is one other factor contributing to the very delicate balance of the labial segments and that is, in the majority of cases, support of

Fig. 3 (2-6) illustrates how incisor relationship can vary merely as a result of a variation of axial inclination of the teeth on a normal

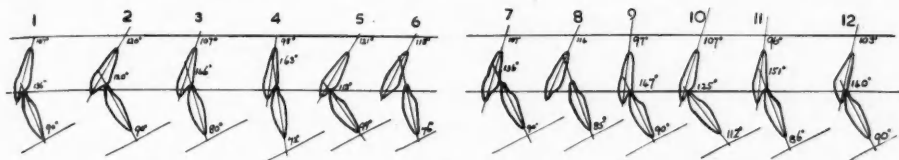


Fig. 3.—Incisor relationships: 1-6, on normal dental base relationship; 7-12, on Class II dental base relationship.

the arch form from the buccal segments. This is easily demonstrated, because if in a normal occlusion with all the teeth in contact the lower first premolars are removed, the lower labial segment tilts lingually and the

dental base relationship, and Fig. 3 (7-12) shows variations of incisor relationship on a mandibular dental base which is postnormal to a maxillary dental base. It will be seen that, broadly speaking, any increase of the

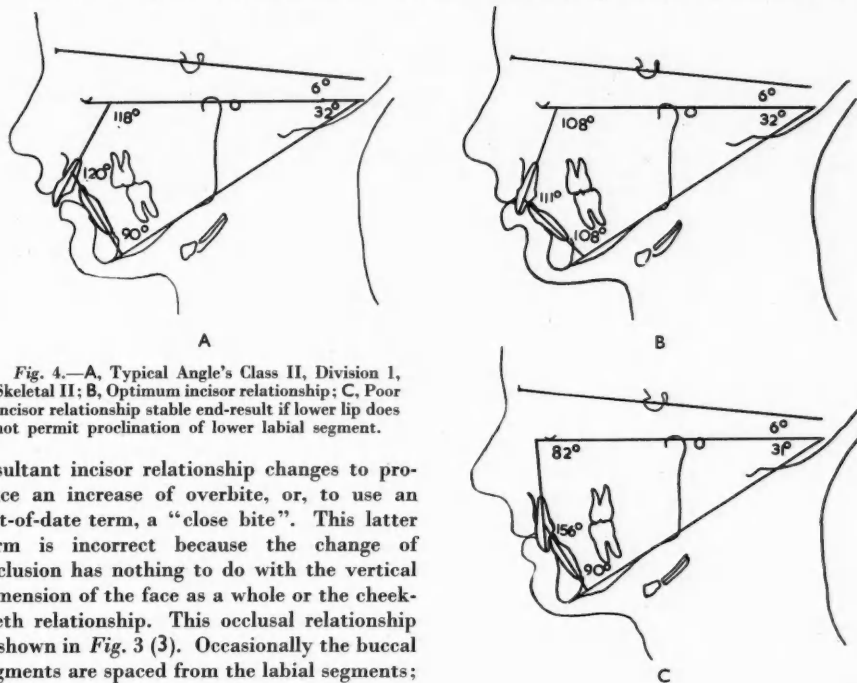


Fig. 4.—A, Typical Angle's Class II, Division 1, Skeletal II; B, Optimum incisor relationship; C, Poor incisor relationship stable end-result if lower lip does not permit proclination of lower labial segment.

resultant incisor relationship changes to produce an increase of overbite, or, to use an out-of-date term, a "close bite". This latter term is incorrect because the change of occlusion has nothing to do with the vertical dimension of the face as a whole or the cheek-teeth relationship. This occlusal relationship is shown in Fig. 3 (3). Occasionally the buccal segments are spaced from the labial segments; in other words, the labial segments are in balance in soft-tissue relationship without the support from the buccal segments; in such cases early loss in the buccal segments does not affect incisor relationship.

axial inclination relationship of the incisors above the angle of 140° leads to an excessive incisor overbite, and any angle below 130° tends to be a bimaxillary proclination which

aesthetically is not acceptable in this country, although it is better than an excessive incisor overbite.

Now to discuss briefly the significance of dental base relationship. There is no evidence whatsoever to support the view that ordinary environment (and this includes orthodontic treatment) can change the inherent skeletal pattern. In other words, if an individual is born with an inherent skeletal pattern which

is frequently not attainable because of the behaviour of the lower lip and the tongue, and the only stable end-result may be as in Fig. 4 C. This, as I see it, is frequently an unsound occlusion with excessive incisor overbite, but it is the only possible compromise in many cases, and you as periodontists must realize this.

There is no time to discuss in detail the variations of posture and behaviour of tongue

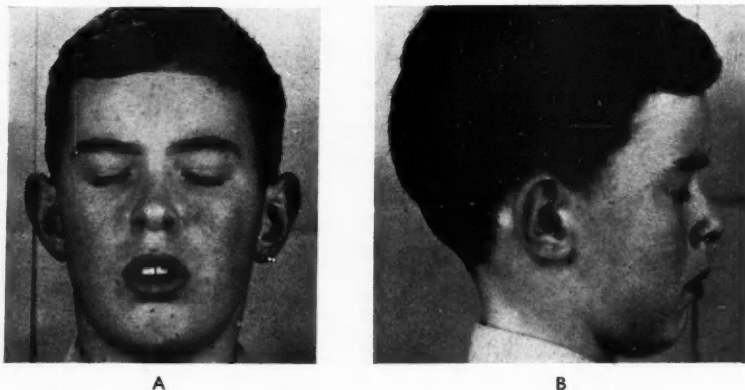


Fig. 5.—A, Resting posture of incompetent lips. B, Contraction of mentalis and orbicularis oris to close lips.

is an abnormality of dental base relationship, that cannot be changed, and from the point of view of the incisor teeth the relationship will be a compromise from the normal (Fig. 3 (7-12)).

Fig. 4 A shows a typical Angle's Class II, Division 1 on a Skeletal II pattern. The position of the labial segments is the result of both lip and tongue posture and behaviour, and the skeletal variation. The latter cannot be changed. Treatment depends on how the former can be. The ideal compromise is as in Fig. 4 B, in which the upper incisors have been retracted to an aesthetically satisfactory angle and the lower incisors have been proclined to occlude with them. The buccal segments, of course, will have to be adjusted in their anteroposterior relationship to maintain contact with the changed position of the labial segments. Unfortunately we know from experience that this satisfactory compromise

and lips which are important in orthodontic treatment planning and stability of end result. Briefly, they are as follows. Firstly, there is the incompetent lip action (Fig. 5). It is the facies which used to be called adenoidal. We now know (Gwynne-Evans; Ballard) that this has no relationship to chronic nasal obstruction; it is an inherent posture, probably a discrepancy between the soft-tissue morphology and the skeletal morphology. The musculature in the open lip posture has the same resting tonus as the normal closed lips posture, and these individuals have to contract the orbicularis oris and mentalis muscles to close the lips. No amount of exercising will change the inherent physiological resting posture. It requires conscious effort to maintain the contraction in the extreme cases. They are of interest to you because they expose the gingival margins of the upper incisors, leading to deterioration in health.

They are not mouth-breathers, however, in the majority of cases, because tongue and soft palate are in contact—in other words, the

characteristic apparently tight lower lip (Fig. 6), which tucks in under the upper lip, maintains the lower labial segment in an extremely

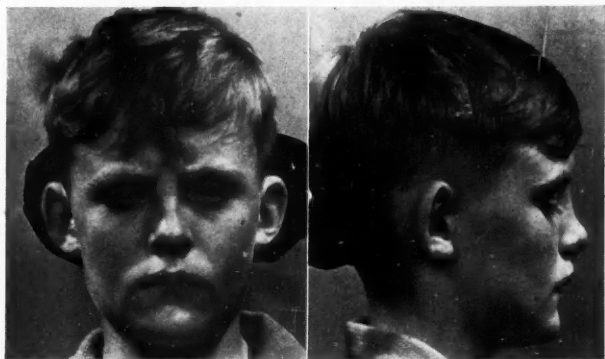


Fig. 6.—Full-face and profile showing tight lower lip tucking in under upper lip and maintaining lower labial segment retroclination.

posterior oral musculature is competent (Ballard; Gwynne-Evans).

The second factor is the abnormal swallowing action which has been very fully described by Rix. Briefly, the tongue thrust during the

retroclinated position, and which does not permit us in treatment to produce a normal incisor relationship.

Finally, there is what appears to be a normal posture and behaviour of the lips which is



Fig. 7.—Typical full-face and profile of Class II, Division 2.

abnormal swallowing action tends to procline the upper labial segment, and the contraction of the lower lip to resist the tongue thrust tends to hold back the lower labial segment, so increasing the overjet. The presence of the tongue may also result in a reduction of overbite. The third is the

associated with the typical Angle's Class II, Division 2, incisor relationship (Fig. 7). In these cases the balance between lip and tongue results in a bimaxillary retroclination. It is the abnormal axial inclination of upper labial segment to lower labial segment in these cases which results in the excessive overbite. It is

not a failure of vertical development of the dento-alveolar structures. *Fig. 8* shows the typical excessive incisor overbite of the Angle's Class II, Division 2. In the extreme cases lip

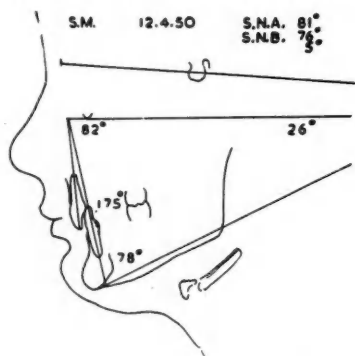


Fig. 8.—Typical excessive incisor overbite of a Class II, Division 2. Note the high angle between upper and lower incisors.

posture does not permit an adequate proclination of upper and lower labial segments to establish a normal incisor relationship. *Fig. 9* shows the treated and stable end-result of the case in which upper and lower incisors are still a little retroclinated, there is a high angle

an incisor relationship by retroclinating the upper incisor. This again results in an excessive incisor overbite over which we have no control. In both the Class II, Division 2, type of incisor

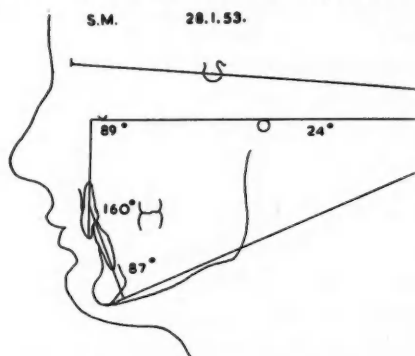


Fig. 9.—Stable end-result of *Fig. 8*. This is a poor incisor relationship because lip posture would not permit sufficient proclination of upper and lower labial segments.

relationship and these Class II, Division 1, treated cases there may, of course, be direct trauma to the gingival margins. The excessive overbite may extend to the canine region and limit lateral excursion.

From the point of view of traumatic incisor occlusion it is the Skeletal III dental base relationship which gives me most concern. *Fig. 10* shows a typical Class III incisor relationship in which both upper and lower labial segments are in balance in soft-tissue behaviour on a Class III dental base relationship. The empirical treatment in these cases is to push the upper incisors labially so that overbite holds them in that position. Unfortunately this is frequently a traumatogenic position because we have pushed the upper labial segment out of its position of balance in soft tissues and it is only being held by occlusion; in other words, at rest the upper lip is tending to push the upper labial segment lingually, and in occlusion the lower labial segment knocks it forward. Frequently after this line of treatment, if one puts one's fingers on the upper incisors and asks the patient to bite rapidly up and down, the upper incisors can be felt to rock forward with every impact

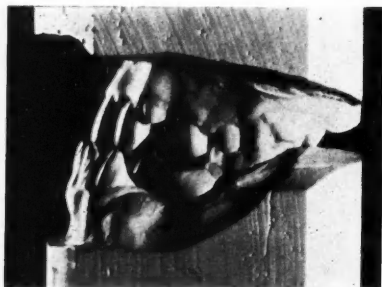


Fig. 10.—Typical Class III incisor relationship.

between upper and lower incisors, and as a result, an excessive overbite. Orthodontically, no further improvement is possible.

Now to revert to dental base relationship. I have already pointed out in *Fig. 4 C* that in Class II, Division 1, cases associated with a Skeletal II pattern frequently the soft-tissue behaviour only permits the establishment of

of the lower incisors. We almost invariably attempt to avoid as much of this trauma as possible by removing the lower first premolars if the buccal segments are in contact with the lower labial segment. The reason for this is that having removed the support of the buccal segments from the labial segments the position of equilibrium of the lower labial segment changes, and it will drop lingually a little.

these cases have proved quite untreatable, and have had to be referred to the Periodontal Department because of the gingival condition (Fig. 11). Unfortunately, there is nothing that orthodontic treatment can do to improve this incisor relationship unless it is to fit a bite-plate which will depress the lower incisors out of occlusion, followed by a permanent skeleton metal structure to the lingual surface

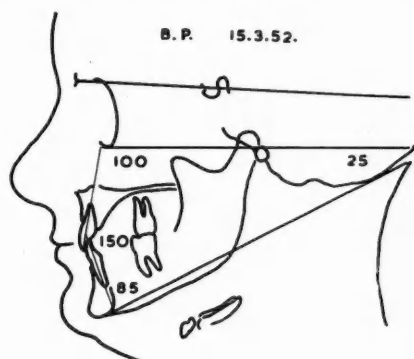


Fig. 11.—Optimum incisor relationship without orthodontic treatment but with high angle between upper and lower incisors.

However, in many Class III cases it would seem that the only possible line of treatment to establish entirely non-traumatic relationship is to resect the mandible. Unfortunately, of course, many of these Class III cases are maxillary retrusions and resection is aesthetically unsound. Some years ago Mr. G. Parfitt said that from the periodontal point of view he thought that the edge-to-edge incisor occlusion did more harm than any other type. I personally would dispute this; on Class III cases I feel that an edge-to-edge incisor relationship is better than an overbite held by occlusion as described. Unfortunately, one sees many cases of so-called normal incisor occlusion on a normal or mild Class III dental base relationship. The angle between upper and lower incisors is high, and instead of the incisal tip occluding with the middle third of the lingual surface of the upper incisors, the labial incisal aspect of the lower incisor hits the lingual surface of the upper incisor with a sliding contact, and facets are produced. Several of

of the upper incisors which alters the angle of the occlusal surface on which the lower incisors bite.

Reverting to the question of physiological balance, it was J. R. Thompson who put the question of physiological rest position on a sound basis, and who demonstrated that in the normal individual this is constant, and the mandible moves from it upwards and forwards with a rotatory movement of the condyle through a distance of about 2 mm. into occlusion. He also showed, conclusively I believe, that certain abnormalities of occlusal relationship disturbed this normal path of closure and the distance through which the mandible moved into occlusion. The distance through which the mandible moved into occlusion he called the "freeway space". The physiology of the establishment of normal occlusion would appear to be that the dento-alveolar structures grow vertically to fill the intermaxillary space, and, as I have previously said, the inherent growth factor is controlled

by occlusal forces. At the moment of occlusal impact, however, there is a reflex relaxation of the main muscles of mastication. When there is an abnormal occlusal contact the very sensitive proprioceptive fibres in the supporting structures of the teeth appear to cause, reflexly, a stimulation of the main muscles of mastication to take the mandible away from the abnormal occlusal contact. For instance, in a Class II, Division 2, incisor relationship the mandible will close through a distance of about 2 mm. until the labial surfaces of the incisal tips of the lower incisors hit the lingual surfaces of the upper incisors at a very steep angle. This is a sliding contact, and reflexly the mandible is retracted away from this by a contraction of the horizontal fibres of the temporalis muscle. This contraction not only takes the mandible distally and pulls the condyles back a fraction into the soft vascular tissue of the posterior part of the joint cavity, but it also reflexly causes activity of musculature at a position at which in the normal occlusion there would be relaxation. This produces an occlusal level which is overclosed, or, in other words, there is an excessive freeway space.

In these typical cases, then, you may have firstly joint symptoms due to the distal displacement of the condyle, and secondly, an excessive freeway space or true overclosure. The correct treatment, of course, is to change the axial inclination of upper and lower incisors in order to remove the abnormal occlusal contact. As I have already pointed out, however, lip posture frequently limits the change of axial inclination which we can produce. It may be that with further investigation we shall find that in some of our extreme Class II, Division 2, incisor relationships we are doing more harm than good by producing a partial correction. We all know that some Class II, Division 2's are very traumatic, with destruction of supporting structure and loss of labial segments. On the other hand we see some extreme Class II, Division 2's in the parents of our patients which at the age of 50 or over are perfectly healthy.

These abnormal paths of closure are, of course, not only the result of incisor relation-

ship. They may be the result of abnormal canine relationship or premolar relationship, and they may result in a unilateral distal displacement of the mandible. For instance, if the maxillary arch is half a tooth width narrower than the mandibular arch, this will produce in centric an uncomfortable cusp-to-cusp relationship of the cheek teeth. This subconsciously and reflexly is not tolerated, and the mandible will invariably swing from centric at physiological rest to left or right to produce a cusp lingual occlusion on one side and a normal lateral relationship on the other. Sometimes the patient with such an abnormal path of closure will present with joint symptoms on the side to which the mandible swings. I believe this is due to the fact that again the horizontal fibres of the temporalis muscle contribute to this swing of the mandible, and the condyle on that side is pulled into the vascular structures of the posterior part of the joint cavity.

The third and most characteristic abnormal path of closure is, of course, produced by the potential Class III relationship in which the incisors from centric bite edge-to-edge, and then the mandible swings forward away from this edge-to-edge occlusion to the so-called pseudo-Class III. Finally, and a little outside normal orthodontics, we have the abnormal paths of closure resulting from loss of cheek teeth, a tilting of the remainder, and the abnormal occlusal relationship so established.

I must now deal with the important question of functional occlusion in relation to the treatment of the arches which exhibit general overcrowding in normal soft-tissue behaviour and on normal dental base relationship. It is probably true to say that in this category can be placed all those cases which show a collapse of the arches with loss of space for canines and premolars after early loss of deciduous molars.

Those who advocate orthodontics for the masses support the view that the easiest way to treat is to extract either four pre-molars or four first permanent molars. However, in my view this so disturbs the axial inclination and contact relationship of the teeth that, unless

very carefully done and very carefully controlled, in many cases more harm than good will be done. Whether or not one supports the view that the periodontal conditions one sees later in life in such mouths are the result of trauma due to occlusal stresses through abnormal axial inclination of the teeth, or whether it is food packing past disturbed contact points, or a combination of the two, I am convinced it is the duty of the orthodontist to attempt to establish normal contact relationship and normal axial inclination of the teeth, both to one another in the same arch and to the opposing jaw. This in many cases can only be accomplished by extensive orthodontic treatment.

Fig. 12 shows a typical case. There has been early loss of deciduous teeth, a forward tilt of lower molars, and rotation of the upper molars, impacting first premolars. The labial segments have also collapsed, resulting in excessive incisor overbite. It is my opinion that such an occlusion may remain healthy until early middle life, at which time a rapid deterioration followed by loss of teeth occurs.

Finally, to revert to the vertical dimension, a typical variation amongst Nordic types is the high Frankfort-mandibular plane angled skeletal pattern with a maxillary retrusion associated with an anterior open bite. There is great depth to the intermaxillary space anteriorly, the open bite being the result of the inherent vertical development of the dento-alveolar structures reaching its maximum before this intermaxillary space is filled. It is important to realize this, because in the past the empirical treatment for such an anterior open bite has been extraction and grinding of the cheek teeth. This is an entirely unsatisfactory procedure, and I have never known it to produce any improvement. Even two molars only in occlusion are sufficient to establish an occlusal level which is in normal relationship to the physiological rest position. Occasionally there is either a local or complete failure of vertical development of the dento-alveolar structures, a comparatively rare condition. When it is local there may be an open bite, usually in the cheek teeth region. When it is complete to one jaw or both, there may be

a very excessive freeway space, and true overclosure.

In this very short paper I have only been able to touch briefly on some of the factors

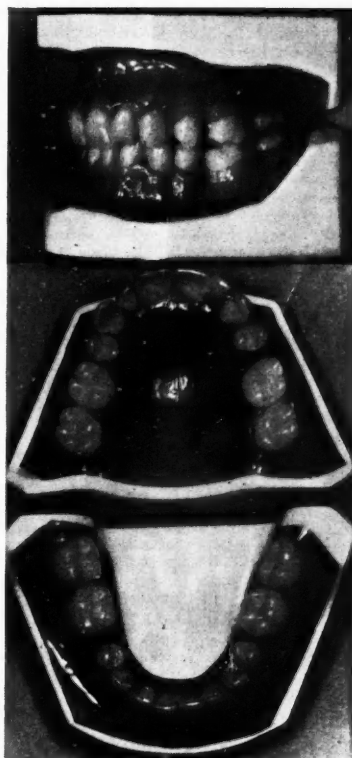


Fig. 12.—Typical "collapsed occlusion" after early loss of teeth in buccal segments.

which I think are of fundamental importance both to the orthodontist and the periodontist. Much has still to be learnt. It may be that now that the orthodontist is able to study by radiological cephalometrics the actual tooth movements that occur during treatment, some of the at present limiting factors to the establishment of an acceptable occlusion will not be so in the near future. I feel certain, however, that there is much work to be done by the periodontists and the orthodontists in close co-operation with one another if treatment

in every case is to produce the optimum occlusion for that individual so that it is best able to withstand disease.

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The Annual Clinical Meeting of the Society was held on Friday, April 17, 1953, at the Eastman Dental Hospital. The Programme was as follows:—

Clinical Demonstrations:—

Sub-gingival Curettage, by W. G. Cross, M.S., B.D.S.

Gingivectomy by Electro-Coagulation, by P. A. Trotter, L.D.S.

Table Demonstrations:—

Biopsies from Hard and Soft Tissues, by B. E. D. Cooke, F.D.S., R.C.S., M.R.C.S., L.R.C.P. A diagrammatic and microscopic demonstration of methods for taking biopsies, illustrated by colour transparencies.

Laboratory Aids in Treatment of Periodontal Conditions, by R. Taylor Heylings, M.B., Ch.B., B.Ch.D. The use of bacterial smears in teaching the relative value of different therapeutic agents in the treatment of cases of ulcerative gingivitis, with illustrations of some cases using laboratory procedures.

Scaling and Polishing Technique, by P. J. Hill, F.D.S. A review of instruments and methods with special reference to the damage

which may be caused to the teeth and supporting tissues, together with a suggested routine for scaling.

Cold Sterilization of Instruments, by F. E. Hopper, F.D.S. The use of an antiseptic solution to sterilize dental instruments and prevent rusting during storage.

Stages of Interdental Loss of the Periodontium, by J. Harrington, B.D.S., and J. S. Mackenzie, L.D.S. Description of the stages of division of the interdental papilla and the subsequent absorption of the septal bone, together with suggested treatment at various stages.

Aids to Undergraduate Teaching, by W. B. Balderston, L.D.S., L.R.C.P., L.R.C.S. Demonstration of models shown to students and a method of record keeping.

Oxygen Insufflation of the Periodontal Lesion, by L. M. Roxburgh, L.D.S. A method of introducing oxygen into the tissues where there is venous stagnation in order to promote reparative processes by producing an artificial hyperæmia.

Where Gingivectomy Fails, by A. B. Wade, F.D.S. B.Ch.D. A demonstration by means of models, diagrams, and photographs of some of the reasons for the lack of success in performing the operation of gingivectomy.

Display:—

Aetiological Factors in Periodontal Disease.

The Annual General Meeting was also held on Friday, April 17, at which the Council was elected for the session 1953-4.

President: A. Frank Stammers, M.D.S.; *President-elect:* F. E. Hopper, F.D.S.; *Hon. Secretary:* Hamish Thomson, H.D.D.; *Hon. Treasurer:* G. A. Cuthbertson, H.D.D.; *Hon. Librarian:* W. G. Cross, M.S., B.D.S.; *Council Members:* R. D. Emslie, F.D.S., A. B. Wade, F.D.S., B.Ch.D.; *Associate Member:* H. Colin Davis, L.D.S.

NATIONAL HEALTH SERVICE

AT an Inquiry held at Doncaster on Aug. 29, 1952, the Tribunal directed that the name of George King Moore, L.D.S. R.C.S., should be removed from the Dental List of the Executive

Council for the County of the West Riding of Yorkshire, and that his name should not be included in any corresponding list kept by any other Executive Council.

CRITICS' CORNER

(Under this heading we print letters which discuss points arising from articles which have appeared in the DENTAL PRACTITIONER, together with the comments of the authors when necessary. We trust that this section will prove of interest to all our readers and stimulate further discussion.)

Fluorine and Dental Caries

[A Reply to the letter of GILBERT J. PARFITT, F.D.S., M.R.C.S., L.R.C.P., J. LONGWELL, D.Sc., F.R.I.C., and A. M. THOMSON, B.Sc., M.B., Ch.B., (see *Dental Practitioner*, April, p. 233)].

The conception of the toxic fraction, contrary to my critics, is of the utmost biological importance. It is the only factor to account for mottling of teeth and other toxic symptoms that become apparent in the pulp tissues and in the marrow spaces of bone. It proves that fluorine intoxication, under circumstances of imbibing calcium reactable fluoride, is progressive. Though a considerable amount of work remains to be done on this subject, what has already been done has its foundations solidly laid.

Let us examine first of all the circumstantial evidence. We, in Britain, and people elsewhere, have been imbibing a fluid extract of tea, containing 0.78 to 1.36 p.p.m. F, with a total intake per day of from 0.86 to 1.39 mg., in areas low in fluorine, without the typical symptoms of mottling and other bone changes. Incidentally, children from such areas are used as controls in proving that 1 p.p.m. F in water reduces the incidence of dental caries. Again, from soup made from the bones of sheep or cow we can imbibe fluorine at the rate of 3.6-4 p.p.m., and ingest from 1.8-2 mg. F in every 500 c.c. of such soup. Yet again with no apparent mottling and other toxic changes in areas low in fluorine.

Let us examine the matter from the chemical angle. Take a hypothetical water supply that comes through the earth from a deep well. It passes, say, through a strata containing sodium silico fluoride or other calcium reactable fluoride, and absorbs a certain amount, say A amount. It then passes through a layer of lime and absorbs say B amount of calcium as calcium bicarbonate. As these substances remain in a completely ionized state in the water, the reaction between the two substances will be reversible, and no permanent change will take place although the two substances are potentially capable of reacting with one another. They will, nevertheless, retain their identity.

Now to the separation of the toxic fraction. Let us suppose that the calcium in the water supply is in the form of calcium bicarbonate, and the fluorine is of the calcium reactable type. I begin by concentrating the water after first rendering it alkaline with soda. As heat is applied, carbon dioxide is driven off, and the calcium bicarbonate is changed to calcium carbonate, which substance is soluble in water to the extent of 13 p.p.m., whereas the solubility of calcium fluoride is 16 p.p.m. (22 p.p.m. in 1 per cent soda). As the calcium carbonate will fall out of solution before calcium fluoride, no progressive reaction will occur between these two substances to the end of evaporation. If any reaction occurs towards the end of evaporation between the soluble fluoride and any other calcium salt in the water, the reaction will never be complete. When, therefore, I extract with a definite amount of water, I will remove a fraction of reactable fluoride which is soluble in water. The next step is to bring about conditions whereby the reactable fluoride in the water will eventually react with calcium

and convert it permanently into calcium fluoride. If I use freshly prepared calcium hydroxide to render the water strongly alkaline and maintain it in this alkaline condition, then there will eventually come a stage where the reactable fluoride is in sufficient concentration to react with the very soluble calcium hydroxide, and as a stage in evaporation will also be reached where the calcium fluoride is sufficiently concentrated to precipitate out as calcium fluoride, then, under these new conditions the reactable fluoride will no longer exist as such, and as calcium fluoride is a comparatively insoluble salt, when I again extract with a measured quantity of distilled water, I will remove only a minute fraction which will be calcium fluoride. The difference, therefore, between the fluorine fractions A and B will be the toxic fraction X. This is the fraction responsible for mottling of teeth. The result obtained in the second case is used as a blank in the titration. Therefore to say that "drinking waters in which the fluoride ion exceeds the calcium ion are virtually unknown" is beside the point. Actually the water supply of West Hartlepool contains 77 p.p.m. calcium, but it still has a toxic fluoride fraction, or a fraction which went into solution originally as a calcium reactable fluoride salt, or ionized fluorine not balanced by calcium.

Longwell has evaded the fundamental points at issue. If he had repeated my experiments with powdered teeth (par. No. 1 of the letter) and determined the phosphate himself in the various dilutions where sodium fluoride in concentrations of 5, 10, and 50 p.p.m. was brought into contact with powdered bone, he would have been able to state categorically whether phosphate was displaced in proportion to the concentrations used or not. He was unable to make this decisive point, and was merely content to say my experiments were inconclusive. Actually visual observation was sufficient to establish this point. All that was required was to prove that phosphate was in fact displaced.

As regards par. 3, I refuse to believe this was written by Longwell. One of my other two critics must have been responsible for this. To quote from the paragraph: "The West Hartlepool water he uses is very hard and contains magnesium. Evaporation with caustic soda will soften it, and such softening of a magnesium water is an established method of removing fluoride." (Italics mine.)

But let us take it at its face value. In determining the fluorine in the water supply of West Hartlepool, I rendered the solution thoroughly alkaline with sodium hydroxide, and evaporated the whole to a small bulk, which was then distilled, and the average of 5 determinations by this method yielded a total of 2.6 p.p.m. F. Would Longwell be prepared to say this is only a fraction of what the water contains?

As regards the rest of this criticism (pars. 4-11), I beg leave to withdraw from further comment, as these points are dealt with in a paper now in the press.

Yours etc.,

CHARLES DILLON.

Caladh,
Fort William.

PARLIAMENTARY NEWS

THE NATIONAL HEALTH SERVICE DEBATE

In the debate on the National Health Service in the Commons on Monday, Mr. Aneurin Bevan said, "The two services where money is attracted from the Exchequer by the initiative of the patient are, mainly, the dental and ophthalmic services."

"Quite often the patient will go to an ophthalmic optician merely on the advice of his doctor, or sometimes he is not advised and he will go to the dentist even though his doctor has not advised him to go."

"Let us look at those two items of expenditure because it has always been the case made against a Socialist experiment of this sort—and I say it advisedly—that, being free, it would be abused; that being free there would be no control over the expenditure, and that, being free, the Chancellor of the Exchequer would never know how much money he had to find."

"If we look at the expenditure on these two services, the dental service and the ophthalmic service, a curious picture, completely contradicting that fear, is shown. In 1949-50 the expenditure on the general dental service for England and Wales was £42,628,000. In 1950-1—that is, after there had been one full year's experience—the expenditure was £40,337,000. After the back-log had been worn off, when the neglect had been made good and when people were using the dental service normally, the expenditure had begun to fall. That is a very important point to consider. The same is even more true of the supplementary ophthalmic service for England and Wales, where the expenditure in 1949-50 was £21,750,000 and in 1950-1 was £19,572,000."

Mr. Bevan continued: "The Times says that it is to be doubted—I am paraphrasing—whether we ought to have a free dental service at all—they have not heard that it is not free now—because the Teviot Committee, during the war, advised that we should require eighty-eight more dentists in order to have a free universal dental service and we had not got enough."

"Surely the fact is that, as a consequence in charges on the Dental Service, the demands upon the dentists have declined very seriously indeed. A cut of one-third is expected in total dental earnings and of 55 per cent in State payments compared with 1950-1. Why was there a shortage of 88 dentists in Great Britain before the war? It was because the standards of the British people were so low that they did not provide a living for more dentists."

"What is done now by continuing the charges on the Dental Service is to perpetuate a low standard of dental health for the people of Great Britain."

"No one would deny that good dentistry is one of the most valuable preventive services. Therefore if we save immediately, if we make the budgetary saving on dentistry, we shall ultimately have to pay more in hospital bills. It is a bad saving. It is not a saving at all. It is not an economy."

"It is in fact merely buying larger headaches in the future for immediate relief."

"Therefore The Times has got hold of the wrong end of the stick entirely."

Mr. Iain Macleod (Minister of Health) turned to the general dental service, and said a most fascinating comparison could be made between what had happened under the two Acts. "Here I justify what I said a year ago—that what we needed was a switch in resources and that there were social and medical reasons for charges in the health scheme. First of all, the effect of the 1951 Socialist Act was that in the last full year before the

introduction of charges for dentures, over three million applications were made for dental treatment requiring prior approval, that is mainly dentures. In the first full year after the introduction of charges, the number of applications was not much greater than 1,500,000; in other words there was a deterrent effect of 50 per cent."

Turning to what had happened under the 1952 Act, he said the charges for adults had led to a very slight fall indeed in the real volume of conservative dental treatment of adults. And as many of the courses of treatment costing less than £1 had been provided for obvious reasons under private arrangement, he doubted if there had been any real fall in the number of treatments that had taken place. But, within that, a change of most profound social importance had taken place. The number of children's courses under the Service for the last quarter of 1952 was double that in the last quarter of 1950—350,000 as against 170,000. They comprised 22 per cent of the courses under the Service in 1952 as compared with only 9 per cent in 1950. He was talking, of course, he added, of children treated under the general dental service.

In 1950-1, 63 per cent of the total Exchequer expenditure on dental service was attributable to dentures and as a consequence 44 per cent of the total cost of the Service in 1950-1 was in respect of persons aged 45 and over. At the other extreme, the proportion attributable to children and adolescents, leaving out school dental services, amounted to 9 per cent. "By the second half of 1952, when the charges which we imposed a year ago were in operation, the proportion of total Exchequer expenditure on dental service in respect of those aged 45 and over had fallen to 20 per cent, while for the treatment of children and adolescents it had risen from 9 per cent to 27 per cent", he continued.

Mr. Macleod: "Let me add to that the figures of dentists and their full-time equivalent under the School Dental Service. The figure of over 1,000 in January, 1948, went down and down until it reached 812 in January, 1951, and then let us see what happened; January, 1952, up to 837; October, 1952, up to 958; January, 1953, up to 998, and the figure now, I have no doubt, is well over 1,000 and we are back, having repaired all the damage that was done to the School Dental Service."

"For the first time, therefore—and those figures show the position correctly—since the Act came into force in 1946, there is now a genuine measure of priority for the priority classes. I tell Hon. Members opposite that if they remove the charges on the dental scheme before there is an adequate number of dentists, they will destroy all the progress that has been made towards securing that priority for the children."

POST-GRADUATE COURSES GRANTS

IN view of the increasing costs in running post-graduate courses for registered dental practitioners, the Dental Board has decided to amend the amount payable under the scheme for giving grants-in-aid as follows:—*Maximum Grant*—for 6-8 entrants, increase from $\frac{3}{4}$ to $\frac{5}{4}$; 9-12 entrants, $\frac{3}{4}$ to $\frac{10}{9}$; 13-20 entrants, $\frac{1}{2}$ to $\frac{5}{8}$; 21 entrants and over, $\frac{1}{2}$ to $\frac{3}{4}$ of the total amount of entrance fees; subject to a maximum of £50 instead of £30 for any one course.

OFFICIAL SUPPLEMENT OF THE
SURGICAL INSTRUMENT MANUFACTURERS' ASSOCIATION (INC.)
 DENTAL LABORATORIES SECTION

Chairman : E. G. EMMETT, F.I.B.S.T.

Administrative Offices : 6, HOLBORN VIADUCT, LONDON, E.C.1

Telephone: CITY 6031

Vol. III, No. 3

June, 1953

Editorial Committee: D. M. BEAUCHAMP; H. J. POTTER, F.I.B.S.T.

EDITORIAL

DURING recent years a prominent function of our association has been the laying down of a code of professional conduct to which it is expected the members will give adherence and honour—that the dentist is the customer, and through him each serves the public to the best of his ability.

It follows that such an association should do whatever is possible to establish standards of efficiency and excellence of workmanship, rouse itself to supervise the training of its junior members, and enable the whole membership to get together to discuss the problems of the day. It should be an advantage to the dental profession to know that if they employ one of a recognized association the work will be properly performed.

Responsibilities of membership are not at all irksome, and they have their reward in leading to a knowledge, appreciation, and mutual support of friends in competition. In these days of collective representation, it should be known that S.I.M.A. has recently interested itself in the difficulties of a member and sought Queen's Counsel's advice on his behalf.

Much has been done in Southern England to animate the legacy of lethargy inherited from former times, by the arranging of demonstrations, lectures, and conferences, which have been supported by the dental surgeons on the one hand, and the employed

technicians on the other—efforts, too, which have received the approbation and personal attendance of travellers from the North and Scotland.

The pioneers will shortly enjoy the satisfaction and pleasure of attending in their turn conferences and exhibitions arranged by enthusiasts in other centres, in our own kingdom at Preston, and on the continent at Paris. Association activity of any kind offers scope for the latent abilities of our members to become apparent and useful.

Those responsible for the organizing of the last International Dental Congress booked the Royal Festival Hall when the foundation stone was laid five years before—time seeming all too short for the achievement of such a magnificent result. We may assume the Italians have their plans well on the way for the next I.D. Congress in Rome in 1957. Let us now prepare to be present, to meet again with our newly found continental friends and others, and let the world-wide dental profession know that the world-wide laboratory industry desires to serve it well.

CITY AND GUILDS EXAMINATIONS, 1953

Students taking the Intermediate Examination in 1952 – 538, 1953 – 680.

Students taking the Final Examination in 1952 – 71, 1953 – 163.

PROS AND CONS OF POLYVINYL CHLORIDE

[MR. G. M. GOWER, one of our genial London members, in his outside activities, has been a member of several athletic associations. At present he is captain of the Gerrards Cross Cricket Club, and in winter plays hockey for Gerrards Cross and Buckinghamshire County. Last year he gave a most helpful talk about



Mr. G. M. Gower explaining his array of specimens at Norbury Library.

soft linings for dentures, illustrated by many samples of his work, and we publish an account of his lecturette in the same conversational style in which it was delivered.]

POLYVINYL CHLORIDE.—What a pity it is that this soft plastic is not entirely satisfactory from the dental technicians' point of view. By that I mean for the soft linings of acrylic dentures and obturator flaps. P.v.c. is excellent for permanent duplicating moulds for teaching models, small plaster bowls, and de Pass mouth props; model formers and many other useful articles may be made by the technician, if he is in the mood for "playing".

Used in conjunction with co-polymers and different plasticizers, p.v.c. is useful material for the general prosthetist in the making of

cosmetic artificial features to replace missing organs, and cover disfigurements. These plastics may be coloured with pigments, and slightly opacified to give the translucent effect of natural skin. Gum shields made from this material have been found a boon to boxers, and last any length of time if kept dusted with boracic powder when not in use. Unfortunately, when it is used continuously in the mouth, it tends to harden on the surface, the length of life being from six to eighteen months according to the nature of the mouth secretions of different patients.

For longest life possible, I find the following procedures advisable: An electric oven properly lagged and thermostatically controlled is best, since curing up to 160° C. gives the best results. If a new denture is to be relined with p.v.c., finish the denture completely, making sure that no further easing is required. In the case of an old denture which is to be relined, S. S. White's impression paste or any similar material should be used as in any normal reline. In either case a cast under-model and recording overbite are made, the model being cast in a stone plaster.

Remove the denture from the model, grind away sufficient hard acrylic to allow for two base wax thicknesses of soft lining, or as much as the denture will allow: with a No. 8 fissure bur make an undercut groove one-sixteenth of an inch from the periphery, and well roughen the whole surface: wax back into the recording model and overbite, flask in the normal way, bringing plaster to the periphery, so that packing is into one-half of the flask: open the flask, wash away the wax, and place the two halves in the electric oven to dry out overnight: since we want to bring the temperature above 100° C., all moisture must be eliminated.

The p.v.c. powder is then thoroughly mixed with an equal volume of dibutyl phthalate, and left to stand overnight: at this stage the mix assumes the appearance of soft snow. In the morning take the flask out from the oven, allow to cool, and apply three coats of cold

mould seal, as in normal acrylic work; place the mix in the oven to stiffen, when it will be ready to pack.

An acrylic solution (equal parts of monomer and chloroform, into which any denture base powder is dissolved to form a workable thin syrup) is then used to coat the roughened

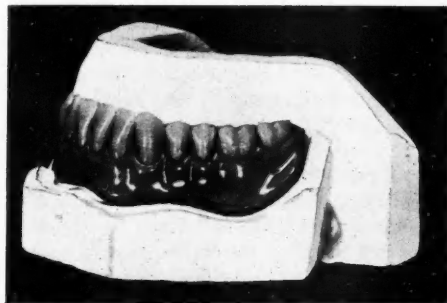


Fig. 1.—Finished p.v.c. relined denture back in plaster records.

surface of the denture, especially round the periphery, p.v.c. powder is lightly sprinkled on this tacky surface with a small camel hair



Fig. 3.—Denture in flask prepared with peripheral groove and undercuts.

brush to ensure best possible union between hard and soft plastics.

Now *overpack* the mix into the mould, close the flask slowly, and *with the excess p.v.c. paste still on the side of the flask*, transfer it to a spring compress, and place in the oven set to a temperature of 140° C. for one hour, then 150° C. for another hour, turning up again to 160° C. until the excess—which is the guide to the processing—turns slightly brown: switch off the oven and leave until completely

cold: deflask, trim excess p.v.c. with scissors, and smooth with a Keystone type of carborundum stone: this finish is quite wearable, but a hot instrument over dry cellophane will give a still smoother finish.

Points to remember: No further easing of dentures is required; make thorough undercut



Fig. 2.—Acrylic plate carrying p.v.c. obturator flap.

retention; completely dry out the plaster mould; syrup solution is a great aid to good retention; pack to excess, as this is the guide to curing; do not exceed 160° C., as this will damage the acrylic denture; do not attempt

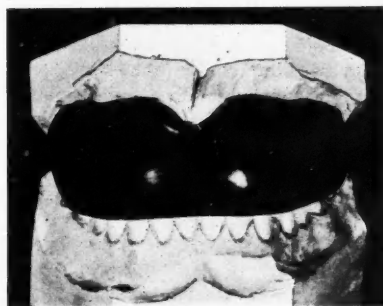


Fig. 4.—Boxer's gum shield in p.v.c.

removal of denture until quite cold as splits may occur in the surface of the p.v.c.: for tougher results use less plasticizer and more p.v.c. powder; make two wooden spatulas from old artists' brush handles—file one to a point, the other to a flat blade, with which to apply the acrylic syrup solution; sufficient for one relining, five dessert spoons p.v.c. powder, one S.S.W. stain measure of titanium oxide, four No. 3 size Portex measuring spoons of Portex red base pigment.

NEWS FROM HEAD OFFICE

Election of Officers.—At a recent meeting of the Main Committee, Mr. E. G. Emmett was re-elected Chairman and Mr. G. Cross Vice-Chairman of the Dental Laboratories Section of S.I.M.A. Mr. H. J. Nowers was appointed representative of the Section on the Council of Management.

Wages during Sickness.—The Unions' proposal to extend the period of half pay during sickness from 4 to 6 weeks per year has been accepted by the National Joint Council, subject to the following conditions:—

a. The maximum entitlement to paid sick leave in any period of twelve months to be twenty-four weeks, that is two weeks on full pay and twenty-two weeks on half pay.

b. No entitlement to wages during sickness to arise until the technician has served for six months continuously with the same employer.

Payment for Holidays.—Revised regulations are under discussion by the National Joint Council, the Unions having requested paid holidays on a pro rata basis, entitlement to commence after one month's service. The Employers' side, on the other hand, consider that there should be some longer qualifying period, with provision for adjustments where the employee leaves after having received more or less holiday than his service has earned. The matter has now been referred back to the constituent bodies for further consideration.

Grading of Dental Technicians.—The Association was invited to submit revised definitions of the various grades, and after long and careful consideration by the committee an amended form of wording has been formulated and will be considered by the Employer's side of the N.J.C. at its next meeting.

Northern Branch.—Our Northern Branch, which now represents an amalgamation of the former North-Western, North-Eastern, and Liverpool Branches, is holding an inaugural meeting at Preston on June 13. All Branches have been invited to participate in the Table Demonstrations which will be a feature of the

Conference, and the Chairman, Mr. E. G. Emmett, and other London members will be present. Mr. Beauchamp will display the specimens of work exhibited at the Paris Conference. Other activities are also being planned and the Conference should be a most interesting one. Members from other areas will be cordially welcomed and their presence will be an encouragement to the Branch. Other meetings will follow in different parts of the area covered by the Branch.

Bulletin.—Requests having been received from many quarters, it is now proposed to resume circulation of a Bulletin for members only, and Mr. H. J. Potter, with the assistance of the Chairman, has kindly undertaken to edit this. We hope this will meet the needs and requirements of members who are unable to take advantage of the facilities of a local branch, but at the same time we would stress the desirability of continued support for the DENTAL PRACTITIONER Supplement, which, through the kindness of the Editors of the journal, has enabled us to reach a much wider public than would be possible through the medium of a Bulletin.

International Conference in Paris.—Members attended an International Conference of Dental Laboratory Associations in Paris on May 16, and took specimens of British work for display on that occasion. A report will appear in our next issue.

Week-end Conference, 1954.—The London Regional Branch has again accepted responsibility for the organization of our next year's Week-end Conference, and preliminary arrangements have been made to hold this at the Holborn Restaurant on Feb. 12-13.

Affiliated Members.—Some of our affiliated members have recently responded to the invitation to take up full membership of the Association, which will give them full voting powers and enable them to participate in determining the Association's policy. We commend this course to any other affiliated members who may now have completed the necessary qualifying period.

NEWS FROM THE BRANCHES

Northern Branch.—Lately formed by the union of North Western, North Eastern, and Liverpool and District branches. (Chairman: C. S. Staton, 66, Adelphi Street, Preston. Hon. Sec.: C. Bradshaw, 608, Bolton Road, Pendlebury, Lancashire.)

A One-day Conference is to be held at the Harris Institute Art School, Avenham Place, Preston, Lanes., on Saturday, June 13.

10.30 a.m.: Reception of long-distance members; address on association matters by E. G. Emmett; report on international conferences in Paris.

12.45 p.m.: Luncheon at the Conservative Club.

2 p.m.: Lecture on "Orthodontics" by James Byrom, Esq., L.D.S. R.C.S.

4 p.m.: Demonstrations and table exhibits including the British display shown at the International Dental Laboratories meeting in the Palais d'Orsay, Paris, on May 16.

Dental surgeons and technicians will be welcome at the two afternoon meetings. Invitation cards may be had from the Chairman or Secretary.

South Wales and Monmouthshire.—The Branch had the pleasure, on March 5, of the company of seventy local members of the profession at the showing of the technicolour film on Myersons' Trueblend Teeth, kindly lent by Messrs. Henry Courtin & Sons, London, and personally brought along by Mr. Marcel Courtin.

The first part of the evening was taken up by the showing of the film, which was extremely well produced and directed. The outstanding features of the film were the excellent colour photography and the diction and personality of the commentator.

The film was followed by two demonstrations. The first, on Swedon Acrylic Denture material, was conducted by Mr. Garfield Powell; and the second, by Mr. Marcel Courtin, dealt with Swedon acrylic filling material.

Both dental surgeons and technicians expressed their appreciation of this first local joint meeting organized by S.I.M.A., and

the hope was expressed that this would be the beginning of a succession of meetings of the type which would be of interest and help to all members of the profession.

West of Scotland.—(From Alex. B. Rae.) In the Grand Hotel, Glasgow, April 9, the first joint meeting with the Glasgow Western Dental Group was held. Mr. Frank Popper gave a very interesting talk on "Functional Balanced Dentures without Tears" to a large and appreciative audience, as could be judged by the numerous questions; all present felt that they had added to their knowledge.

A campaign for new members is planned, made all the more necessary because at the beginning of May, Mr. W. W. Robertson, F.I.B.S.T., left for America with his wife and family; a suitable presentation had been made to him prior to his departure by the branch. Mr. Robertson is an excellent technician, and many had an opportunity at the February exhibition to view the three penguins and a bird which he had carved from cow horn. Our good wishes go with him for success in the New World.

Birmingham.—A double-feature programme of unusual interest was the fare provided at a gathering of the Birmingham Branch at the Chamber of Commerce, Birmingham, on Wednesday, April 29.

Before a good muster of members, Mr. Gardiner, of Coventry, gave an introductory talk prior to presenting a film on eye surgery and artificial restoration. Much interest centred in the fact that in conjunction with an ophthalmic surgeon he was developing a fitment enabling the artificial eye to be "tied" to the muscles in the empty socket, thereby restoring synchronized movement to both eyes. So much could be said of the subject itself that no attempt will be made to describe in detail any part of the technique. It is sufficient to say that the interest of the audience was considerable; such first-hand material is seldom better supported by close-up cinema-photography. There was a satisfying sense of completeness as members were shown

stages from the initial preparation to the final fitting of the artificial eye, and then a display of its mobility by the patient. Mr. Gardiner also gave the commentary.

At the conclusion of the film Mr. Andrew Brown said he would like to pay tribute to this fine effort of Mr. Gardiner and his co-operators. It was a truly revealing show, and although the preparation of the conjunctivæ in the early stage was a little gruesome, he could not express himself as being other than pleased to have been present. His request for a vote of thanks to be signified in the usual way left no doubt of the success so creditably earned.

The second feature was the personal appearance of none other than our hardworking Chairman of the parent body, Mr. Eric Emmett. He addressed the meeting at some length, beginning by saying how much he had looked forward to the opportunity of meeting on their home ground the Birmingham men, the first of the branches to be formed in the provinces and still a source of much strength in the Association; he expressed admiration for the tenacity and purpose they displayed in Association affairs. Turning his observations in a personal direction, he spoke highly of the Branch Chairman, Gerald Cross, who fully deserved his recent election as Vice-Chairman of the Dental Laboratories Section of S.I.M.A.; and he was constrained to feel honoured at his acceptance. It was no mean effort to give the time and endure the inconveniences of travel to the duties involved

some five or six times a year. This, of course, included Mr. Gardiner, who as Branch Representative makes his own valuable contribution.

The general work of the Section was then referred to by Mr. Emmett. Detailing some of the more intricate machinery of negotiation and policies pursued, he summed it up thus: "We are not making headlines, but our consultation is an essential part of decisions taken by various dental bodies in matters affecting our vital interests; that in itself is fast bringing recognition in its train." He then commented on the show they had just seen. Here, he said, was an instance of the surgeon working jointly with the technician, proving their worth to one another. He gladly endorsed the remarks of Mr. Brown and could not speak too highly of Mr. Gardiner's effort. Indeed, he would like to see all the Branches served with this same educational material. Thanking the Chairman and members for the hospitality they had shown him as their guest, he concluded his speech amid great applause.

Mr. Gerald Cross, Branch Chairman, allied himself with the remarks of Mr. Brown and Mr. Emmett anent the Hebbard-Gardiner film and its presentation. He was sure everyone had enjoyed it for he thought it had surpassed all expectations. Paying tribute to the ardent enthusiasm that prompted Mr. Emmett to make the journey from London for so few hours, he expressed the appreciation of himself and of all the Birmingham members for his presence and for his excellent speech to the assembly.

THE SELECTION OF FORCES FOR TOOTH MOVEMENT

THIS paper is one of a symposium on fundamental orthodontic questions prepared by the Faculty of Dentistry, University of Toronto.

The forces inherent in orthodontic arch wires and springs were measured by a strain gauge sensitive to variations of one-tenth of one gramme and incorporating an electronic device. The gauge consisted of a transducer for converting the force to electrical energy, an amplifier, and an ink-writing oscillograph.

Variations in the diameters and lengths of auxillary springs affected the force in the manner which might have been expected. The investigation into the forces inherent in various types of arch wire used with a multi-band technique is most revealing, indicating how readily an excessive force, or a force applicable over an excessive range, can be produced. The experimental results are shown graphically and the investigators have drawn conclusions pertinent to orthodontic practice.—HALDERSON, H., JOHNS, E. E., and MOYERS, R. (1952), *Amer. J. Orthodont.*, 39, 25.